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The Journal of the Department of Agriculture of Victoria, Australia.

November, 1920.

PRINCIPAL CONTENTS

The Cost of Butter Production

New Zealand Flax

The Angora Goat

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OF

THE DEPARTMENT OF AGRICULTURE,

VICTORIA, AUSTRALIA.

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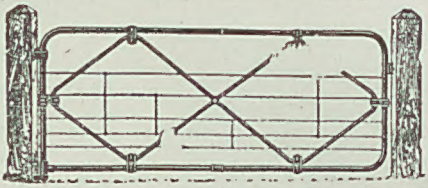

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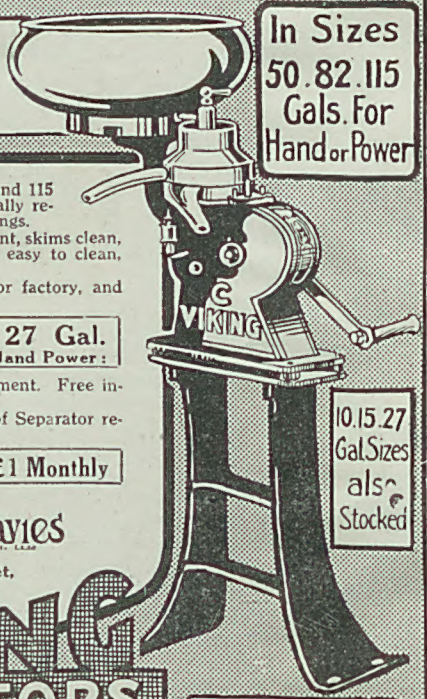

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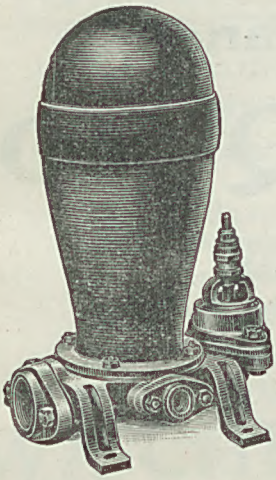

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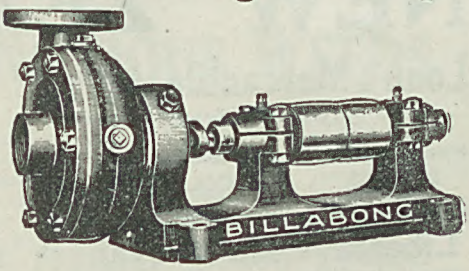

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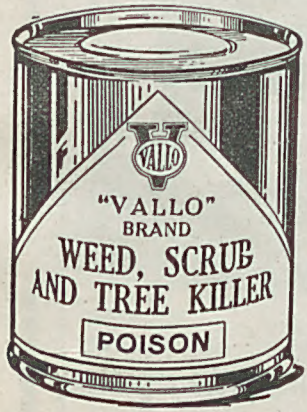

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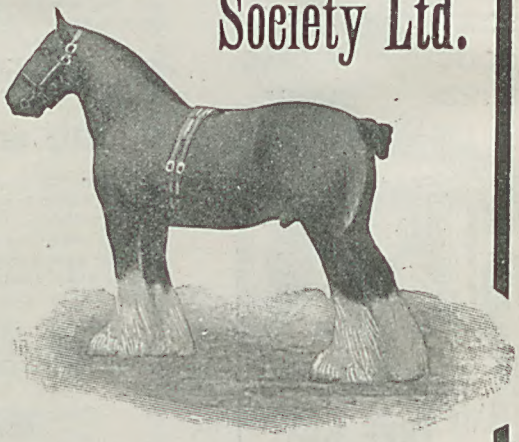

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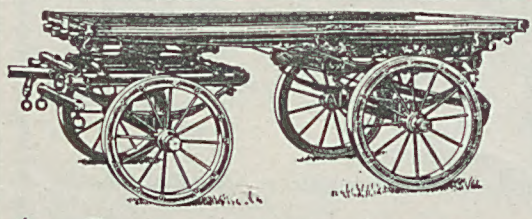

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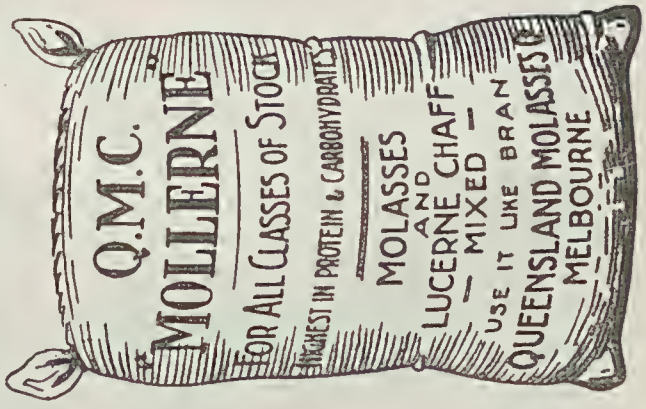

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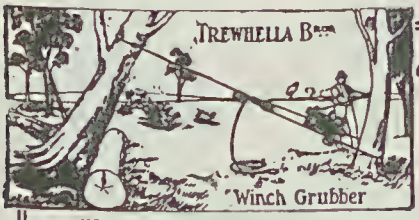

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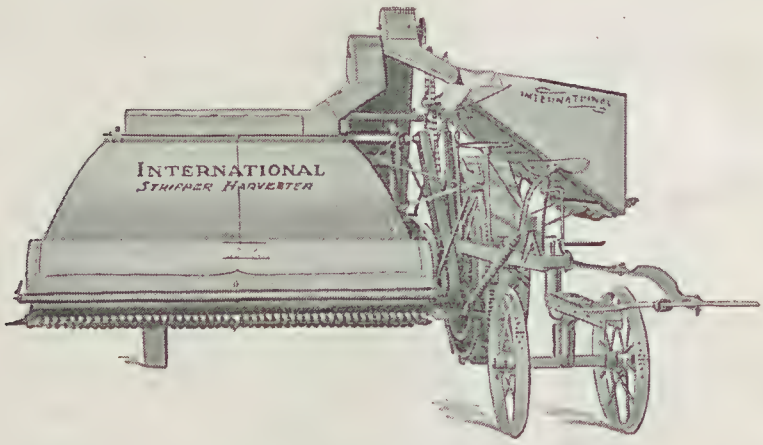

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THE COST OF BUTTER PRODUCTION.

By R. Crowe, Export Superintendent.

At a recent Dairy Supervisors' examination, replies to one of the questions indicated the necessity of bringing up to date, matter published by the Department of Agriculture some years ago relating to the cost of feeding dairy cows and labour in milking, &c.

Further, it is very necessary, in view of the special attention usually directed to the price of dairy produce, when the present high cost of living is discussed that dairymen and others interested should be fully advised regarding the cost of production and method of arriving at same. It is expected that this article on the subject will not only supply this need, but will, in addition, be opportune in showing the majority of dairymen the absolute necessity, in their own interests, of taking immediate steps towards conserving as hay some of the present surplus grass, and to grow fodder, in order that the lactation period of cows may be prolonged and their yield increased. It is hoped also that ambition towards improving the breed of dairy cattle will be stimulated.

Unless dairymen take full advantage of the present opportunity to cheapen the cost of production by paying more attention to the breeding, feeding, and management of their herds, the dairying industry will not flourish as it should. With the low returns secured in past years, it can be understood that many dairymen were not in a position to pay for good pure-bred bulls from proved profitable dairy ancestors, nor could they pay for labour of cultivation and seed for fodder crops. Now, with the present season's high prices, the necessary implements and labour, &c., can be afforded.

The tables on pages 642-3 show the position generally of dairying in the various States of the Commonwealth.

DAIRY STATISTICS.

AVERAGES COMPUTED FOR FIVE (5) YEARS 1913–1917 FROM YEARLY RETURNS.
EXTRACT *Commonwealth Year-Book*, No. 12, 1901–18, PAGE 392.

State.	Average No. of Cows.	Average Production.	Average per Cow.
		Gallons.	Gallons.
Victoria	560,186	187,809,400	335
New South Wales	768,723	225,322,400	293
Queensland	368,978	90,630,200	245
South Australia	93,916	26,852,000	289
Western Australia	30,712	6,314,800	205
Tasmania	54,041	12,326,400	229
Federal Territory	714	91,400	129
Commonwealth	1,877,270	549,346,600	292

INVESTIGATION *Re* COST OF PRODUCTION.

State.	(1) CAPITAL INVESTED.		(2)	(3)	(4)		(5)	(6)	BALANCE, LOSS.
	Per Cow.	Amount.	INTEREST AT 6½ %.	PERSONS ENGAGED IN MILKING.	WAGES at £3 WEEKLY.	INTEREST AND WAGES.	BUTTER ESTIMATED AT 22·5 lb. Milk to 1 lb. BUTTER.	VALUE AT 2s. 3d. lb.	
	£	£	£		£	£		£	£
Victoria	100	56,018,600	3,641,209	37,000	5,772,000	9,413,209	83,470,844	9,390,470	22,739
New South Wales	75	57,654,225	3,747,525	50,000	7,800,000	11,547,525	100,143,288	11,266,120	281,405
Queensland	75	27,673,350	1,798,702	24,000	3,744,000	5,542,702	40,289,088	4,531,509	1,011,193
South Australia	75	7,043,700	457,840	6,000	936,000	1,393,840	11,934,222	1,342,600	51,240
Western Australia	75	2,302,400	149,700	2,000	312,000	461,700	2,806,577	315,740	145,960
Tasmania	75	4,053,075	263,450	3,600	561,600	825,050	5,478,400	616,320	208,730
Federal Territory	75	53,550	3,480	40	6,240	9,720	40,622	4,570	5,150
Commonwealth	82	154,799,900	10,061,906	122,640	19,131,840	29,193,746	244,154,041	27,467,329	1,726,417

TABLE SHOWING AMOUNT LEFT FOR WAGES AFTER DEDUCTING INTEREST ON CAPITAL INVESTED.

State.	Value of Product.	Interest.	Balance left for Wages.	Persons Employed in Milking.	Rate of Wages.	
					Per Year.	Per Week.
	£	£	£		£	£ s. d.
Victoria.. ..	9,390,470	3,641,209	5,749,261	37,000	156	3 0 0
New South Wales	11,266,120	3,747,525	7,518,595	50,000	150	2 17 9
Queensland ..	4,531,509	1,798,702	2,732,807	24,000	114	2 4 0
South Australia ..	1,342,600	457,840	884,760	6,000	147	2 16 6
Western Australia	315,740	149,700	166,040	2,000	83	1 12 0
Tasmania ..	616,320	263,450	352,870	3,600	98	1 17 6
Federal Territory	4,570	3,480	1,090	40	27	0 10 6
Commonwealth ..	27,467,329	10,061,906	17,405,423	122,640	142	2 14 7

1. The capital invested to maintain one cow the year round is ascertained by taking an average herd of thirty cows, and finding out the acreage and value per acre of land required to keep that number, together with one bull and a pair of horses, the value of the horses, harness, implements (such as plough, harrows, mowing machine), vehicles (such as dray and delivery cart), cream separator, utensils (such as cream cans, milk buckets, &c.).

Owing to the high price of land, implements, utensils, &c., to start dairying at present, considerably more than £100 per cow would require to be invested. It is recognised that the great majority of those engaged in dairying, own land, cows, horses, harness, implements, vehicles, and utensils, which cost much less than present prices, and this is taken into account in estimating £100 as the investment necessary to keep a cow the year round in Victoria. Owing to the cost of land suitable for dairying in the other States being at a lower level than in Victoria, the investment necessary to maintain a cow the year round is stated at £75.

All these average estimates are considered to be on the low side, and interest at 6½ per cent. is equal to £6 10s. per year in the case of Victoria—or 2s. 6d. a week, for the feed of a cow and the use of horses, harness, implements, vehicles, utensils, &c., necessary in carrying on dairying. Dairymen who have had to buy feed during the last two seasons at several half-crowns per cow per week (for many months last season the cost of feeding was 15s. per week) are not expected to agree with this low estimate. The basis, however, is for a period of five years, and applies to the whole State, pasture comprising the great bulk of the cows' food requirements.

Dairymen should not take the figures as being quite mathematically correct. The method is submitted as an illustration to show the manner of computing an estimate in each individual instance—singly, collectively, or from the State point of view.

The following details may be useful:—

	Average Estimate.	Estimate No. 2.
Land to keep thirty cows, one bull and two horses, say, 60 acres at £40 per acre; or 80 acres at £30 per acre; or 120 acres at £20 per acre; or 160 acres at £15 an acre	£2,400	£4,800
Thirty cows and one bull at £15	465	800
Two horses	30	60
Harness	10	34
Plough, harrows, and mowing machine ..	25	40
Dray and spring cart	35	70
Separator and utensils	50	150
Divide by number of cows (30) ..	£3,015	£5,954
Investment for one cow	£101	£198

In No. 2 estimate, it is shown how the average may be easily doubled. In some localities dairying land is sold for twice the prices mentioned. Picked herds may be purchased for £25 a head, and a bull for £50. Horses could run into £60 for the pair. New harness would cost £34. Ploughs, &c., £40. New dray £40, and spring cart £30. Separator, &c., £60. Oil engine, shafting, and belting, £90.

In most instances, land was secured years ago. Stock was chiefly bred by the dairyman himself, whilst harness, implements, and utensils have seen a good deal of service, and may be valued as shown in the average estimate.

2. Capital invested in dairying is entitled to the current rate of interest, and it does not matter whether the farm is wholly or partly paid for. The first call on the earnings of the farm should be to meet interest on capital invested.

Where a dairy farm is rented, rent takes the place of interest to the extent of its proportion of the total cost of keeping a cow under the heading of land. Interest on cost of horses, harness, implements, vehicles, utensils, &c., would naturally have to be added to the rent.

3. It is estimated that a herd of thirty cows will keep two persons fully employed the year round—attending to them generally, milking, separating the milk, delivering the cream, cleaning utensils, cultivating, harvesting, and feeding, &c. As all of the cows are not in profit at the one time, an allowance off the total is made in each calculation.

4. It is estimated that labour is worth £3 per week, including keep.

5. Milk is converted into butter, cheese, condensed, concentrated, and dried form, and is also used in its natural state.

This investigation is based on the parity of all products being equal to the contract price of 274s. per cwt. for this season's export butter. Therefore, all the milk has been converted into a butter equivalent, and 2¼ gallons or 22.5 lbs. of milk are estimated to produce 1 lb. of butter on the average the whole year round. This estimate is purposely made on the high side; the true average will be more like 2⅓ gallons, or 23.3 lbs. milk to the lb. of butter. If calculated at 23.3

lbs. milk to the lb. of butter, the estimated yield and value of butter would be very much below those shown.

6. The present price of export butter (274s. per cwt.) is equal to 2s. 5d. 5-14d. per lb.; the cost of manufacturing and marketing is stated at 2d. 5-14d., leaving 2s. 3d. available for distribution to producers. As a matter of fact, the cost of manufacturing and marketing would be nearer 3d. per lb., and the value of the product available for the producers less than the figures in the table indicate.

It may be asked why butter was obtainable years ago for half the present price. To a very large extent, the cheap milk and butter enjoyed by the community was at the expense of sweated labour of children who did a good deal of the milking for no payment at all beyond their food and clothing. It is to be hoped that such a state of affairs will not be reverted to again. Hired labour was then obtainable at rates varying from one-third to one-half the rates of to-day. On the basis of 274s. per cwt. for butter there is scope for the payment of only £2 4s. per week (inclusive of keep) for labour in Queensland, and £1 12s. in Western Australia. In the two States mentioned the price of butter for local consumption has been fixed by the Government at considerably below the export parity. It has been stated that the reason why the Imperial Government raised the price to 274s. per cwt. was to encourage dairying in the Dominions. By some of the Governments fixing the price at a lower level, it would appear they are not desirous of assisting in that direction. A basic living wage is assured for labour in many industries, but it will be seen that even if producers got full market value on the basis of 274s. per cwt., the amount left for remuneration in the two States mentioned falls very far short of an adequate livelihood.

So far, skim milk has not been referred to. When whole milk is sold to condenseries, &c., a higher price must be given than for butter-making, as the farmer has not the skim milk for feeding pigs or calves, and so with butter factories retaining the skim milk for the manufacture of casein. On the other hand, no allowance is made for depreciation of implements, utensils, harness, and replacements of cows and horses. With a herd of thirty cows, five or six calves have to be reared yearly, necessitating the keeping of as many yearlings and two-years-olds to take the place of cows that grow too old for dairying and cows that meet with accidents. It is not unusual for a cow or two to die occasionally.

The returns from skim milk would approximately meet these and other contingencies, and in instances where a balance was shown, it could be regarded as profit. Any industry should return more than interest and cost of labour. Dairymen are to be found in every district and in each State who have made money out of the industry and become independent. Many have been most successful. Their success is due to foresight in selecting suitable land, and to their skill in breeding and management. They are not average men. Such being the case, there must be many who are engaged in the industry securing less than the low average returns shown.

Now, some effort should be made by each and every one concerned to lift the industry and all those engaged in it. How can this be done? By increasing the yield from cows, and thus cheapen the cost of production. In other words, "Breed, Weed, and Feed": Breed better cows, weed or cull out the unprofitable cows, and replace them with better ones. Improved cows will not grow up to take the place of duffers unless steps are taken to breed them. Feed the cows. The yield of even the average cows that already exist could be greatly increased in the meantime by making provision for feeding them better, chiefly by growing fodder to prolong the milking period, and incidentally, to keep them up in condition, so that they will come into fuller profit the following season.

Some idea of the relative merits of dairy cows may be obtained from the following results obtained from thirty-two superior cross-bred cows, all grazing on the same pasture, and receiving similar treatment, viz.:—

No.	Name.	Milk.	Test.	Butter Fat.	Price 2s. 7d. lb. equals Value.
		Gallons.		lbs.	£ s. d.
1	Caroline	697	4·2	292·74	37 16 1
2	Star	641	4·2	269·22	34 15 6
3	Spot	630	4·2	264·60	34 3 0
4	Lottie	683	3·6	245·88	31 15 2
5	Bess	531	4·5	238·95	30 17 3
6	Kitty	563	4·2	236·46	30 10 10
7	Lily	509	4·6	234·14	30 4 10
8	Stumpy	732	3·2	234·24	30 5 1
9	Fanny	575	4·0	230·00	29 14 2
10	Flo	697	3·3	230·01	29 14 2
11	Bawley	619	3·6	222·84	28 15 8
12	Mary Ann	662	3·3	218·46	28 4 4
13	Jenny	670	3·2	214·40	27 13 10
14	Blossom	666	3·2	213·12	27 10 6
15	Polly	587	3·6	211·32	27 5 10
16	Snaily	521	4·0	208·40	26 18 3
17	Judy	502	3·8	190·76	24 12 9
18	Rosy	594	3·2	190·08	24 11 0
19	Lady	435	3·9	169·65	21 9 3
20	Bonny	430	3·9	167·70	21 13 2
21	Dolly	421	3·8	159·98	20 13 3
22	Molly	392	4·0	156·80	20 5 0
23	Matilda	492	3·2	157·44	20 6 8
24	Liz	399	3·8	151·62	19 11 8
25	Princess	409	3·7	151·33	19 10 11
26	Betty	385	3·9	150·15	19 7 10
27	Cherry	375	4·0	150·00	19 7 0
28	Nelly	471	3·2	150·72	19 9 3
29	Violet	359	3·8	136·42	17 12 4
30	Gloss	347	3·8	131·87	17 0 7
31	Redmond	365	3·6	131·40	16 19 5
32	Pansy	299	3·7	110·63	14 5 9
		16,658	..	6,221·33	803 10 4

The yields and butter fat percentages were actually recorded, and the present average price paid for butter fat applied, with the above results.

The cows were fed wholly on pasture, and no effort made to supplement it during the autumn or winter months.

The average return in milk per head was 520 gallons, and of butter fat, 194.41 lbs., valued at £25 2s. 2d. The return in butter fat from the best cow was 292.74 lbs.; from the ten best an average of 247.62 lbs.; from the ten worst, 142.15 lbs.; and from the worst cow 110.63 lbs. In money, the return from the best cow was £37 16s. 1d.; from the ten best, an average of £31 19s. 7d.; and from the ten worst, an average of £18 7s. 8d.; and from the worst cow, £14 5s. 9d.

The record is brim-full of information, and suggestive in many respects. It was quite possible to considerably increase the yield of all the cows by attention to feeding. In the course of time by breeding and weeding, a herd of thirty-two cows equal to the ten best could be got together. With this accomplished, the monetary return would be £219 more. This is much more easily and quickly done on paper than in actual practice, but all the same, by concistent effort in the direction indicated, it can be done, and achieved too without necessarily increasing the capital invested to keep each cow the year round, except that the cattle themselves will have a greater value. The labour would be the same in either case. However, when it comes to increasing the annual yield by improved feeding, the labour cost will naturally be greater. For instance, the average yield of all the cows in Victoria for the five years 1913-17 was about 150 lbs. of butter. The present cost of production, on the average, is about 2s. 3d. per lb. If the average were increased to 225 lbs., with the same land, &c., and labour, the cost of production would be reduced to 1s. 6d. per lb. of butter.

These are the directions in which the cost of production can be reduced. The present extremely high prices for dairy produce will not continue indefinitely, and it is suggested that full advantage should be taken of the present opportunity by the average dairymen to place themselves and the industry in which they are engaged on a better footing.

Not only will they benefit themselves by doing so; every member of the community will also ultimately gain by getting plentiful supplies at a lower price. Needless to add, the State is vitally concerned as well, for the greater the production the larger the surplus to export overseas, to bring goods and money back in return. Dairying is one of the staple industries of Australia. Its present magnitude can be seen in the first table of this article, and the possibilities are not confined to the improvements under the headings of Breed, Weed, and Feed, for if permitted to be placed on a payable basis, the area devoted to dairying could be vastly increased.

THE ANGORA GOAT.

PROFITABLE SCRUB EXTERMINATOR.

By J. S. McFadzean, Senior Dairy Supervisor.

Apart from the magnificent covering of mohair, the trade name for the silky fleece which they grow, Angora goats bear a strong resemblance to the ordinary domestic variety. When in full fleece their general appearance certainly inclines somewhat towards that of the full-fleeced Lincoln sheep, but in its general habits, including that of browsing on shrubs rather than grazing on pasture, the resemblance between the Angora and the domestic goat is strong. The main point of difference is that while the latter is kept exclusively for milk-production, the Angora is of little use in this way, its fleece and its flesh being the direct sources of profit for which it has always been farmed.

Originally a native of Western Asia, the Turks are said to have continuously bred the pure strain of these goats for long prior to the Christian era. Towards the middle of the past century farmers in both America and South Africa took up the breeding of this stock to such an extent that the Turkish Government foresaw serious competition in the production of mohair by those countries, and the export of Angora breeding stock was prohibited, but not before both America and South Africa had secured sufficient stock to supply all requirements for stud purposes.

It would appear that these original Asiatic Angoras were of much smaller size than those now bred in other countries, crossing with the domestic goat and selection of breeding stock having both been practised to advantage. Size and robustness of constitution were first obtained by this means, and by close selection and careful breeding the quality of the mohair has been retained and the staple possibly somewhat improved.

Experiments in Goat Rearing in Victoria and South Australia.

The first record of this breed coming to Victoria was the importation of seven head from South Africa in 1856 by Mr. Sichel, of Melbourne. On landing these were purchased by the Zoological Gardens committee, and in 1863 this stud was added to by another importation of twelve which were presented by the French Government in return for a consignment of native fauna which had been sent there from Victoria. By 1866 this flock had increased to ninety-three head. Then, in 1870, owing to the limited area held by the Zoological Committee at Burnley and Royal Park, several of the flock were disposed of at £5 5s. each. Fifty of them were also sent up to Longerenong in that year, where they did well; and in 1873 the mohair from this flock was sold at an average price of 3s. 6d. per lb. Yet another importation was made from South Africa by the late Hon. Robt. Simpson, in 1873, and sent to the Langi Kal Kal Station, near Trawalla, where the carcases of two wethers bred from these are recorded as weighing 80 lbs. each when dressed, while three of the best fleeces weighed 17 lbs. each.

In 1888 a Mr. Kempe put together a flock of 150 pure Angoras in South Australia, to which he added about 100 females of the common short-haired goat, and bred up from these until he had a flock of some

1,200 head. These are reported as having cut an average of 4 lbs. of mohair every eight months, which was sold at varying prices up to 10d. per lb. Consequent on the death of Mr. Kempe, this flock was sold by auction in Adelaide, and averaged £1 per head all round. Some mohair from this flock—probably from the pick of the pure stud—was said to have topped the English market.

Suitability of Australian Climate for Goat Rearing.

It would appear that in every way the Australian climate is particularly suited to the breeding of Angoras, as Mr. Hollings, a Bradford (Eng.) expert, is quoted as saying that Australian mohair is finer in quality than that from South Africa, where there is an export duty of £100 per head on Angora breeding stock. Again, in 1907, a sample of mohair from New South Wales sold in New York at 4s. 2d. per lb. This was 6 lbs. of a 10-lb. fleece of 15-inch staple cut from a buck owned by Mr. G. H. Martin; the animal itself was sold for 75 guineas. An instance of their hardiness under dry conditions comes from South Australia, where in the drought of 1902 Mr. Kidman carried a flock of 1,000 Angoras through on a station north of Lake Eyre without loss, when 92 per cent. of the whole of the station cattle died.

The one condition which they apparently cannot stand is excessive wet. So long as they have hill country to travel on, and some fairly dry shelter at night, they will do well. But there is one instance recorded from the Yea district where, possibly owing to being harassed by dogs, the goats left the hills and kept about the homestead on the lower country near the river. Here they did not live long; all but two of twenty head died from fluke or other parasitic illness contracted on the wet land.

The Goat as a Scrub Exterminator.

Besides the return from the sale of mohair and mutton, Angoras are particularly valuable for clearing up scrub land. If run in flocks averaging two to three head per acre, they wear out the scrub and undergrowth by continually browsing on the leaves and young shoots. A flock of 200 in the Healesville district in five years cleared a 150-acre paddock so that it could safely be sown to grass.

Unless confined to small area, a few goats have comparatively little effect on scrub growth, as the trimming of the shoots is not repeated often enough to kill the plants.

They are smaller feeders than sheep, and where they have been held for any time on grazing land it has been noticed that it can safely be stocked at least 15 per cent. heavier with goats than with sheep.

Feeding, &c.

Notwithstanding that the bulk of the food of an Angora flock will be obtained from browsing on scrub and undergrowth, the animals will be greatly benefited by having access to a small area of good grass, if available. It improves both the condition of the stock and the quality of the fleece, and when the females are rearing the kids each year some good grazing will greatly improve their milk yield, and assist to the better raising of the young stock.

The one great necessity for the welfare of Angoras other than dry shelter is that of clean water. The running water of the hill country

is ideal, but anything approaching stagnation in the drinking pools is apt to result in the stock becoming affected with lung or stomach parasites. Salt should always be available for their use on the range, it being quite as essential for goats as for sheep or cattle.

Where there is no dry natural shelter on the range, such as scrub or rocks, it will be necessary to build rough shelters of logs, stone, bark, or sawn timber, so that they may have reasonable protection during periods of excessively wet or cold weather.

Breeding.

For purposes of breeding, the usual proportion is about one male to forty females. Between seasons the males should not be allowed to get into low condition. If the food supply grows scarce on the range, some fodder, such as hay or roots, should be supplied them. Half-starved males will not throw robust stock, and their fleeces will not be as valuable as those of the progeny of properly nourished bucks. None

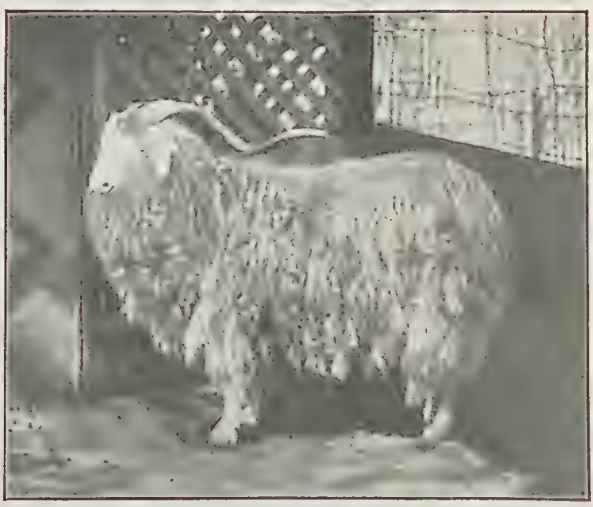
Three First-cross Angoras.

but the very best bred males obtainable should be used, since by this means alone is the standard of the flock and the quality of the mohair to be improved. No effort should be spared to make every year's work in these respects show definite advancement on that of the preceding year. If only one extra good male can be obtained, this should be mated to selected females, and the best of the young males kept for use with the older flock females in the next season; and by using each pure-bred male with his own stock for two or three successive crosses the desired improvement will be much more quickly attained than if a male from a fresh strain is used each year.

Where pure or good grade females are not available in sufficient number to make the desired increase in the flock, some common nannies may be used. In choosing these, however, the best selection possible should be made, as the better shaped they are the less culling will be required at a later stage.

Where possible, shapely animals, fine in head and horns, straight and broad on back, deep in body, and with short hair, should be

selected. The first cross of the pure male from these will show very little improvement in fleece, and will not be worth shearing; but from this



Pure Angora Buck.
(Sire of the three first-cross nannies illustrated on opposite page.)

Common Goat.
(Dam of the three first-cross nannies illustrated on opposite page.)

onward each cross will show a marked advancement, both in fineness and length of staple, until the fifth cross of the pure male should throw

stock with fleece very little below the pure stock in quality. Careful selection of the breeding stock each year makes for quick improvement.

For convenience of handling, supervision, and to give them proper care, a regular breeding season for the flock should be fixed. It will be best to arrange that the kids be dropped about the time the spring grass is coming on, so that the dams may have a full milk supply for the young. In order to fix the breeding season the males should be kept in a separate paddock, except for a period of about eight weeks, when they should be allowed to run with the matured females

The period of gestation is from 147 to 150 days, and during this time the breeding females must be kept under regular observation to see that during the winter they do not lose condition; neither should they be allowed to get over fat.

The young females of the flock should not be mated until about fifteen to eighteen months old; and, to insure this, all male kids over four months old should be paddocked away from the females. All

A Small Herd of Goats in the Healesville District.

male kids not required for breeding should be castrated when about two weeks old—the operation being the same as with lambs—and, when weaned, they can then run either with the younger females or with the rams. Keeping the wethers with the young females will allow of the breeding nannies being handled as required and given extra feed and shelter, if necessary, through the winter.

Care at Kidding Time.

For a few weeks prior to kidding, whoever is in charge of the flock should be about amongst them occasionally so that the goats may become accustomed to his presence and be the more easily handled later on. When close on to kidding it will be as well to herd them at night in a sheltered yard, both for their protection and to save time in inspection in the mornings. This should always be done while the kids

are coming, for if allowed a free run, the depredations of crows, hawks, and foxes will cause much loss.

Although it is not advisable to drive the females with a dog when heavy in kid, one that is well trained will be of great assistance in mustering a flock on a big range. A dog which will work wide and not frighten the goats will save a lot of time in mustering and yarding.

One of the best systems is that in which the kids are dropped in a clean, sheltered paddock near the homestead, the fencing of which can be arranged so that the mothers may be allowed out to feed, leaving the kids inside. If allowed out on the range with the mothers, the kids soon tire and lie down, and being at the mercy of all pests, will probably be killed before the mother returns. On some farms the kids are tethered to stakes, but this restricts their movements greatly, and they do not get the opportunity of racing about together and strengthening their muscles for future travelling. A few high blocks of wood standing near the gateway from the paddock and on each side of the

A Closer View of the Herd Illustrated on Opposite Page.

fence will soon be made use of by the mothers to come and go to the kidding paddock, especially if the fence is topped at this point with a broad plank.

Providing the range is not too extensive and predatory birds and animals not too daring, the kids will be strong enough to travel with their mothers when about five weeks old. It is as well to mark the kids as dropped, and also the dam, with spot of paint or other means of identification, in case they should become separated before the mother properly knows her offspring. At times a mother will leave her own kid and take up with another. Again, an older goat will sometimes drive a younger one away from her kid and take possession of it.

A rack of grass, oaten or lucerne hay will be found handy in the kidding paddock as a change of feed for the nannies. It can be placed some 18 inches from the ground to keep it clean and to prevent the kids getting into it. If boarded below this or forming part of the

fencing on the weather side it will serve the purpose of shelter also. In the yard some logs or low boxes will provide exercise for the kids, which require some climbing to harden their muscles.

Some American breeders have found it advisable to have small pens round the breeding yard in which to enclose mother and kid for a few hours till the kid has been suckled. Such pens are usually made moveable, and these should always be on clean ground, thoroughly cleaned after each occupant leaves the pen, as well as before being closed up when the kidding season is finished.

Cleanliness is most important in Angora management, and no one should attempt this work unless he is fully prepared to properly supervize the stock.

Angora Buck.

(From pamphlet on The Angora Goat, issued by the Dominion Department of Agriculture, Canada.)

Shearing.

In warm climates Angoras usually shed their fleece within about ten months, and owing to their feeding over rough country, it is necessary to shear them at intervals of about eight months, otherwise the fleece will drag off in the scrub and much of it be lost. Shearing should be done in the warmer weather of spring or autumn, so that the stock may not suffer from the cold weather any more than cannot be avoided.

The fleece should be folded with the cut side inwards and should not be tied, as anything like shreds of twine, &c., becoming mixed with it would greatly detract from its market value, such material being difficult to separate from the mohair. For the same reason, wool should not be packed with mohair, and only clean packs should be used to bale the mohair in.

As far as possible, each grade of mohair from kids, nannies, wethers, and bucks should be packed separately; or, if put in the same bale,

each grade should be separated by a layer of strong paper and marked accordingly on the outside of the bale for the buyer's information. All stained parts should also be kept separate from the clean mohair.

Mohair.

Mohair is in constant demand for the manufacture of various fabrics. This hair is a silky, lustrous white, being usually shorn from the Angoras when about 8 to 10 inches in length. The lustrous appearance is usually some guide to its texile strength, for, if the stock have not been in good condition the lustre is less pronounced and the staple not

Angora Female.
(From pamphlet on The Angora Goat, issued by the Dominion Department of Agriculture, Canada.)

so strong. This strength of fibre is a most desirable feature in manufacturing.

The best quality of mohair is cut from the younger stock, the fibre of the fleece growing shorter and straighter in the older animals, while the fleece also somewhat loses the wavy character of the staple. In the earlier stages of grading up a flock from common goats, fleeces will frequently be found to carry more or less short, straight hair, known as kemp, and which, being also coarse in quality, is very undesirable in the fleece. By close breeding to pure males this tendency to produce kemp is gradually reduced, and may be finally eliminated. While

mohair has much the appearance of silk, it is stronger and firmer in fibre. It is easy to dye and holds colours well, but kemp refuses to take dye, and will show up badly when material containing it is woven. Mixing of the different grades of mohair for marketing should, therefore, be carefully guarded against, as any sign of kemp in a package or bale will reduce its selling value considerably.

The quality and finish, as well as the durability of mohair, fits it for the manufacture of lustre fabrics, plushes, velvets, braids, bindings, coatings, upholsteries, &c., and the longer the staple is the higher will be its market value. The skins, and particularly those of young goats carrying a fair fleece, are used in the manufacture of robes, rugs, mats, and carriage furnishings; but for making leather goods the pelts are said to be not so suitable as those of the ordinary goat, being somewhat more open in grain.

Angora Mutton.

In considering the advantages of breeding Angoras, full attention should be given to the value of the flesh as an article of food. Both in appearance and in quality Angora mutton very closely resembles that of the sheep. The carcass, as a whole, is well fleshed and attractive in appearance, the legs being full and loin as well rounded off as could be desired. The table quality of the meat is shown by its finding ready sale wherever a regular supply is offering, and it certainly requires a person to be more than ordinarily expert to identify the flesh of an Angora from that of a sheep when cooked.

General Care.

Fencing.

Fencing for Angoras is little different from that of sheep, excepting that nothing in the nature of stone wall or brush fencing will confine them. The ordinary seven-wire fencing, if kept in order, will hold them safely, but no logs or stumps must be left on the fencing line; these would encourage them to jump to the tops of the posts. Further, the stays in the fencing must be wired over so they cannot climb up them. If wire netting is used round the kidding enclosure the mesh must be so small that the kids cannot get their heads through, or they may get hung there; the same remark applies if the fencing be of palings or stakes.

Precautions Required in Briar Country.

Where there are briars on the range there is always the danger of goats which are carrying any length of fleece getting caught therein, and if not released they may starve, and, in any case, would be injured greatly in struggling to free themselves. On such country the briars should be cut, and till this is done the flock should be carefully counted each day. Once cut or burnt the goats will not allow briars or scrub to grow again.

Foot-Rot.

The hoof of a goat may occasionally become overgrown, and, as in the case of sheep, if this extra growth be not cut away and the foot cleaned, a form of foot-rot may ensue. When goats have the run of stoney ground this trouble seldom occurs. as the stones wear the hoofs sufficiently to keep them in shape

Ticks, Etc.

The goats should always be dipped within two months after shearing to guard against attacks of such parasites as ticks and lice, which, by causing the animals to rub on logs and stones may do much damage to the fleece.

Adaptability.

It must not be considered that the Angora is in any way likely to replace sheep as farm stock. One of the very best proofs of the natural suitability of Victoria for the grazing of sheep and cattle is furnished by the history of Angora farming in this State. That this stock has made so little progress in popularity is solely due to the fact that sheep and cattle have been kept profitably everywhere on the fair country, and there has been little call to make use of the poorer hill land. Consequently, the Angora has never been in serious demand. As farm stock on rough, hilly land, much can be said on behalf of the Angora. They are very useful in clearing land of scrub and coarse grass, and, therefore, will live on country where sheep would starve. They will thrive on any but wet or low-lying land, but the rougher it is the better they appear to like it; certainly rough scrub grazing is more to their fancy than good pasture. Weed seeds, brush shoots, heath, and brambles are usually cleaned up by them in preference to succulent grasses, and on this account they are particularly valuable on land which has not been cleared for the plough, and where their fancy for such roughage can be turned to good account.

Their Commercial Value.

The buying price of these goats varies largely accordingly to their breeding and consequent quality. Good grade stock are purchaseable in Victoria in small lots at from £2 to £5 per head, pure stock running from the latter price onward. There is only one breeder in Victoria who has a big flock of this stock. Mr. F. W. Barton, of Point Wilson, Paynesville, has about 1,000 head running on heath and ti-tree land, and is doing well with them. Of all the other flocks in the State probably none exceed 100 head. There is a good stud flock at Wyalong, New South Wales; and flocks in Queensland and South Australia.

Owing to the cattle tick in Queensland the quarantine laws prohibit direct importation from that State to this. To reach Victoria from Queensland goats would require to pass a quarantine period in New South Wales and be certified as being clean of tick in that State before being admitted here.

Up to the present, none of the wool-selling firms appear to have given much consideration to the selling of mohair, for the quantity coming forward has not warranted it. However, one Melbourne firm has now signified a willingness to receive, grade, and market to best advantage all mohair forwarded; and if a sufficient supply comes forward, a regular export trade may be established. There are long stretches of railway land throughout the State which are well fenced and are kept clear of scrub by hand-labour which are eminently suited for goat farming. On many large estates there are also many hundreds of acres where Angoras might be profitably used. Apart from the care of the kids over about two months after birth, the flock will look after itself, and besides their usefulness as scrub-clearers, there is always some profit coming in from either mutton or mohair. It is a line of stock farming certainly well worth the attention of many people.

NEW ZEALAND FLAX.

(*Phormium tenax.*)

Propagation, Cultivation, and Milling Treatment.

By J. Farrell, Orchard Supervisor.

This valuable fibre plant, which belongs to the Liliaceous family, was first mentioned as occurring in New Zealand by Captain Cook, who described it as a grass plant, like flags, of the nature of hemp or flax, but inferior in quality to either, and used by the Maoris for the making of clothing, lines, nets, &c. Royle states that:—"The leaves of the plant are perennial, hard, sword-shaped, from 5 feet to 7 feet in length, with flower-stalk rising 4 feet above them, and bearing a profusion of flowers, followed by triangular seed-vessels, filled with flat and thin black shining seeds. It was introduced in the year 1879 into the south of Ireland, and has been found to flourish on the west coast of Scotland, though European winters are occasionally too severe for it."

Sir James Hector, in reporting to the New Zealand Government in 1889 on *Phormium tenax* as a fibrous plant, says:—

"This general description applies to the Phormium plant wherever it grows in New Zealand and the Norfolk Islands, to which countries its natural range is confined; but it presents many minor variations in habit and growth, according to the climate and soil. These differences are not, however, so great as might be expected to occur in a succulent plant that ranges through eighteen degrees of latitude, or from almost a tropical insular climate to a country possessing a severe winter climate, with prolonged frosts and snowstorms.

In the south, Phormium is never found far from the sea, nor at any great elevation, except on ranges near the coast. Thus, in the interior of Otago, this useful plant is wholly wanting, or only represented by a few feeble bunches, irregularly scattered along the sides of the larger rivers.

On the west coast of the South Island, which, from the sea-line to the limits of alpine vegetation, is essentially forest country, the Phormium plant is not of common occurrence, and is represented by varieties having a lax habit of growth. The only exceptions to this general rule are to be found in the neighbourhood of the large rivers, where there are occasionally limited areas of ordinary swamp flax, as, for instance, the alluvial flats at the mouth of the Buller and Karamea, and to the south of West Wanganui Inlet.

In the North Island, the Phormium is also most abundant and best grown near the coast, but it is also found abundantly in the interior at an altitude of 2,000 feet. It is, however, neither so abundant nor universally distributed throughout the islands as many have supposed.

What are frequently termed "flax-swamps" have often merely a margin of Phormium plants round the edge, the greater part of the extent being covered with raupo (*Typhus angustifolia*). It is true

that in the swamps, when drained, a luxuriant growth of Phormium usually springs up, but this requires considerable time and expenditure, so that such swamps cannot be considered as immediately available for affording a natural supply."

In writing on *Phormium tenax,* in his work on "Select Extra Tropical Plants," Baron von Mueller states:—

"The Flax-lily of New Zealand, where it grows as far south as 46° 30′, and up to an elevation of 4,000 feet, occurring also in the Chatham Islands and Norfolk Island, though not on Lord Howe's Island; it is also found in the Auckland Islands, nearly 51° south (Schur). It flowered in several places in England in exposed positions, and was not affected by severe frost (Masters). It perfected seeds even in the most northern of the Orkney Islands (Traill), and will bear unhurt a temperature of 15° F.; the tops of the leaves become injured at 9° F. (Gorlie). It is desirable that this valuable plant should be brought universally under culture, particularly on any inferior spare ground, or on the sea beaches, or any rocky declivities, where it may be left to itself unprotected, as no grazing animals will touch it; yielding for ever returns; thriving also well in shade. It is evident that the natural growth will soon be inadequate to the demand for the plant. It is adapted for staying bush fires, when planted in hedgerows. Merely torn into shreds, the leaves serve at once in gardens and vineyards as cordage, and for this purpose, irrespective of its showy aspect, the Phormium has been distributed from the Botanic Gardens of Melbourne during many years by the writer. From the divided roots, any plantation can gradually be increased, or this can be done more extensively still by sowing the seeds. In all likelihood the plant would thrive and become naturalized in Kerguelen's Land, the Falkland Islands, and the Pharoe and Shetland Islands, and many continental places of both hemispheres far into cold latitudes. Among the varieties, three are better characterized than the rest—the Tchore, the Swamp, and the Hill varieties. The first and the last mentioned produce a fibre fine and soft, yet strong, and the plant attains a height of only about 5 feet, whereas the Swamp variety grows to double that height, producing a large yield of coarse fibre, which is chiefly used for rope or paper making. One of the most dwarf varieties is P. *Colensoi* (J. Hooker); a lax variety is *P. Hookeri* (Gunn). As might be expected, the richer the soil the more vigorous the growth of the plant. Flooding now and then with fresh or brackish water is beneficial, but it will not live if this is permanent. In swampy ground, trenches should be dug to divert the surplus humidity. Fibre free from gum-resin, properly dressed, withstands moisture as well as the best Manilla rope. Carefully prepared, the fibre can be spun into various textile durable fabrics, either by itself or mixed with cotton, wool, or flax. Elegant articles are woven from it by the Maoris. In October, 1872, the sale of Phormium fibre in London was 11,500 bales, ranging in price from £19 to £31. The tow can be converted into paper, distinguished for its strength and whiteness. The London price of Phormium fibre for this purpose is from £10 to £20 per ton.

Messrs. Christy, Cross and Bevan employ a freezing process in separating all kinds of fibres from stalks and foliage, and this method proved particularly advantageous in treating Phormium. A strong decoction of the root and leaf bases used in surgery for dressing wounds with a view of producing ready and healthy granulation (F. A. Monkton)."

Plate 1.—A Phormium Plant, showing Flower-stalk.

When writing in connexion with the early commercial aspect of this question, Hector says:—

"The history of what is usually termed the flax industry in New Zealand affords a remarkable instance of the difficulty experienced

in developing the natural resources of a country if commodities to be disposed of have not a previously established market value. When the colonists first arrived in New Zealand, the valuable qualities of Phormium fibre were well known, as it was in constant use by the natives, and a very considerable trade in the article existed as early as 1828, when the islands were only visited by whalers and Sydney traders, as £50,000 worth of the fibre was sold in Sydney alone between 1828 and 1832."

From that period up to 1853, the statistics on the subject are very imperfect, but show that a fluctuating trade in native-dressed fibre was maintained. At the same time, many attempts were made to discover a more speedy and profitable method of preparing the fibre than those practised by the Maoris. A company was formed in England in 1844, that sent out hand machines to be tested in the province of Nelson, but they proved unsuitable for the purpose, and the enterprise failed.

From 1853 to 1860, the average annual value of fibre exported was nearly £2,500, but up to this time the only fibre exported was that prepared by native labour, no machinery of any kind being employed. Owing to the native disturbances which affected Waikato and other interior districts of the North Island in 1860, the preparation of Phormium fibre was confined to the native tribes north of Auckland, so that the average value of the export between 1860 and 1866 was only £150 per annum. During this period of depression, consideration was given to the introduction of machinery by which the fibre could be profitably extracted by European labour.

Up to this time, attempts made to extract the fibre were by crushing between rollers, together with boiling in alkaline solutions, and thorough washing, and all the processes then suggested for the preparation of fine-class fibre were mostly on the same principle. The object was to secure greater rapidity of production, so that a sufficient return could be obtained for the labour employed and the capital sunk in the machinery. The first important improvement was that of Messrs. Purchas and Ninnis, in 1861, who introduced percussion instead of rolling, and washing without the use of alkaline solutions. By this means a fibre somewhat similar to Manilla was produced. With these machines, the export of fibre again increased, so that from 1866 to 1871 the yearly average was valued at £56,000, the maximum export in that period being £132,578 in 1870.

During 1871, the name of New Zealand flax was changed to New Zealand hemp in the Home markets, with great advantage to the position which the fibre holds in the brokers' salerooms.

The quantity exported for each of the five years 1914-1919 is shown hereunder, together with its value:—

Year.	Quantity.	Value.
	tons.	£
1914	19,702	455,214
1915	23,320	571,621
1916	27,674	1,001,725
1917	23,516	1,197,396
1918	25,167	1,387,763
1919	22,347	866,930

THE PRODUCTION OF NEW ZEALAND HEMP IN AUSTRALIA.

Phormium tenax, although capable of adapting itself to a wide range of soil and climatic conditions, prefers a temperate zone. Australia offers this plant a genial home, and Victoria may be regarded as the State most interested in its adoption.

As far as soil conditions are concerned, it thrives best on deep, rich, friable and moist but well-drained land; the views held by many persons that the undrained sour swamp is its natural home are quite wrong.

Being an evergreen, and because of its graceful appearance, the Phormium, or New Zealand flax, the name by which it is

Plate 2.—Flower-stalks, showing Seed-pods.

generally known, has, in Victoria, for many years been employed as a decorative plant in parks, gardens, and street reserves. Some very fine specimens may be seen in the Melbourne Botanical Gardens, in the gardens connected with the Burnley School of Horticulture, also in Alexandra-avenue, in the Flemington-road Reserve, and many other places in the city and around the suburbs. Nor has the utility of this specimen of New Zealand flora been lost sight of by those in charge of the public gardens of the provincial cities and towns.

Phormium in the undressed state, as well as in the form of twine and lashing is extensively employed by orchardists in trellising passion

vines, loganberries, blackberries, &c., and nurserymen and vignerons apply it to similar use in their respective lines of business. The utility and durability of green Phormium for this purpose is unquestionable, and the cost of keeping the necessary number of plants to maintain the supply is infinitesimal.

There are many varieties of Phormium, and about 60 were distinguished by the Maoris before 1870. Some contain stronger fibre than others. It is therefore desirable, when selecting plants to be grown for cordage, to choose the best for that purpose.

The orchardists, in trellising the plants, employ narrow strips from ¾ inch to ¼ inch in breadth of the green leaves, and these prove most fitting and durable.

Professor Hutton gives the result of experiments applied to test the strength of the fibre as it occurs naturally embedded in the leaf, as follows:—"In order to ascertain the relative strength of the different varieties, I took strips of ⅛ inch in breadth from the middle part of young but fully-grown leaves, and broke them by means of a spring balance, which I had previously tested, and the following are the average results of my trials made on the leaves of four different plants of each variety:—

Tihore broke with a strain of 48 lbs.
Harakeke broke with a strain of 42 lbs.
Paretaniwha broke with a strain of 42 lbs.
Whaririki broke with a strain of 34 lbs."

These results afford persons previously unacquainted with the quality of green Phormium an opportunity of determining its usefulness for the purposes mentioned.

Propagation, Planting Out, and Cultivation.

With a view to establishing New Zealand flax-fields in Victoria on commercial lines, and to utilize land no longer suitable for the production of nursery trees, Messrs. C. A. Nobelius and Sons, proprietors of the Gembrook Nurseries, at Emerald, have planted out about 100 acres of Phormium in that district. The planting, which was done in sections, commenced in 1915, and the first block consists of about 40 acres, and additions to this during subsequent years bring the total area up to that already stated, and very considerable additions are about to be carried out. A one-stripper mill was erected on the property last year, with the necessary machinery installed, and the first return has been obtained from the planted area. Messrs. Geo. Kinnear and Sons, rope manufacturers, of Melbourne, who purchased the whole of the output, express themselves as being highly pleased with the quality of the fibre.

Plate 1 illustrates the general character and habit of growth of the Phormium plant, and shows the position of the flower stalk. Phormium is naturally a gross feeder, and its growth largely depends on the nature of the soil in which it is placed. That it is reluctant where adverse soil conditions obtain, but responsive when congenial surroundings prevail, may be easily observed. When a large area is planted, the soil throughout being of apparently even fertility, its real nature is disclosed

by the Phormium produced in the different situations. Yellowish, stunted plants will be produced on the poorer parts, while large green ones, which, of course, produce longer and better fibre, will indicate the more fertile positions.

The height of the flower-stalk is regulated according to the growth the bush is making, but it usually extends from 4 feet to 6 feet above the plant. Plate 2 gives an enlargement of the flower-stalk shown in Plate 1, and depicts more clearly the form and position of the seed-pods. The

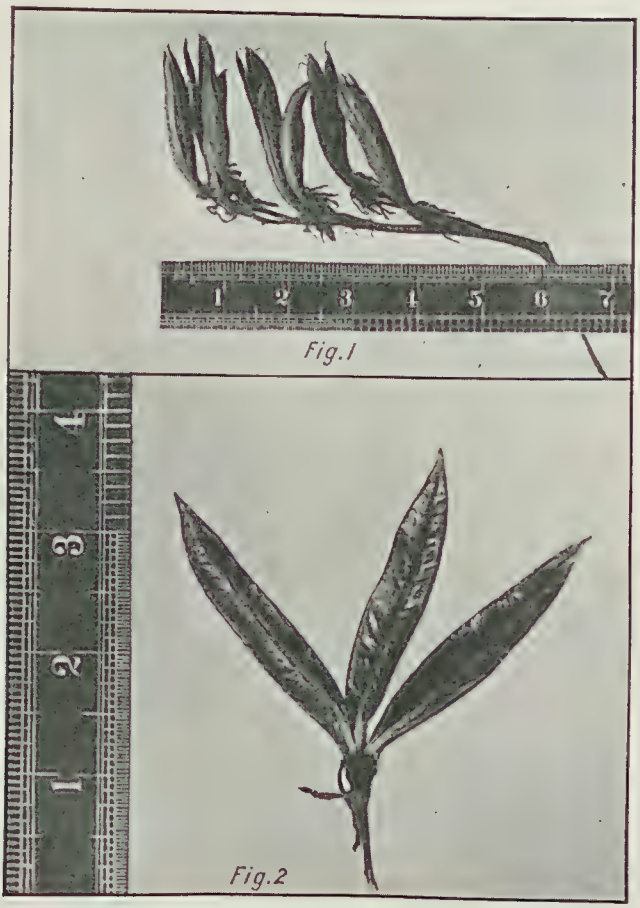


Plate 3.—Seed Pods of New Zealand Flax Plant.

first flower-stalk, about 1 inch in diameter, is produced on the centre fan of the plant, when the part has arrived at a certain stage of development, and this fan shows no further leaf growth, but dies away the following year. There is first a profusion of brilliant red or pink flowers, followed by a number of triangular seed vessels, as shown in the illustration. Large plants are made up of a number of fans with independent stems and fibrous roots. The fans are produced from lateral buds given off by the stems during the successive periods of

growth. The stems, after a growth of several years, and when they have produced a succession of leaves, develop the buds which produce the new fans, bear their flower-stalks, ripen the seed, and then die.

Plate 3 gives further illustrations of the seed vessels. Fig. 1 shows a cluster of pods containing ripe seed. Fig. 2 depicts one of the triangular seed vessels opened and the seeds removed. When grown under favorable conditions, *Phormium tenax* usually fructifies prolifically, but the number of seeds in the pods sometimes varies considerably. The writer has observed that many of the pods contain 100 fully matured seeds, while in numbers of others only 10 or 12 may be present. The greatest irregularity, in point of numbers, occurs in seeds which result from late blooms, as the early or midseason blossoms seed much more satisfactorily. Imperfect pollination is the most likely cause of undeveloped seeds in the seasonable blossoms, as the seeds seem to wither when in the embryonic stage; and unfavorable weather probably aggravates a similar condition of the late blooms.

The twelve thin shining flat black seeds illustrated in plate 4 are natural size, and were taken with 88 others from the empty seed vessel

Plate 4.—Seeds of Phormium Tenax (natural size).

shown in Plate 3, fig. 2. When propagation by means of seed is practised, only that from the very best plants should be used. It should be allowed to fully mature before being gathered, and if kept in a dry cool place until sown, a high percentage of germination usually follows.

Being expert nurserymen, and realizing the advantages which accrue from the use of carefully selected buds, scions, and seeds, in nursery work, Messrs. Nobelius and Sons, when contemplating the planting of New Zealand flax at Emerald, had the seed for the propagation of same collected from some of the best plants to be found in the Dominion. The seedlings used during recent years to extend the planted areas were raised from locally-grown seed.

The young plants are raised in the nursery frames shown in Plate 5. The soil in the frames is first brought to a fine state of tilth, then the seed is sown broadcast and lightly covered with fine earth. The seeds germinate freely, and the little plants are protected from occasional late spring frosts or excessive heat during summer by a hessian covering

placed over the frames. The beds are kept free from weeds, and irrigated when necessary from the tank appearing in the illustration. The

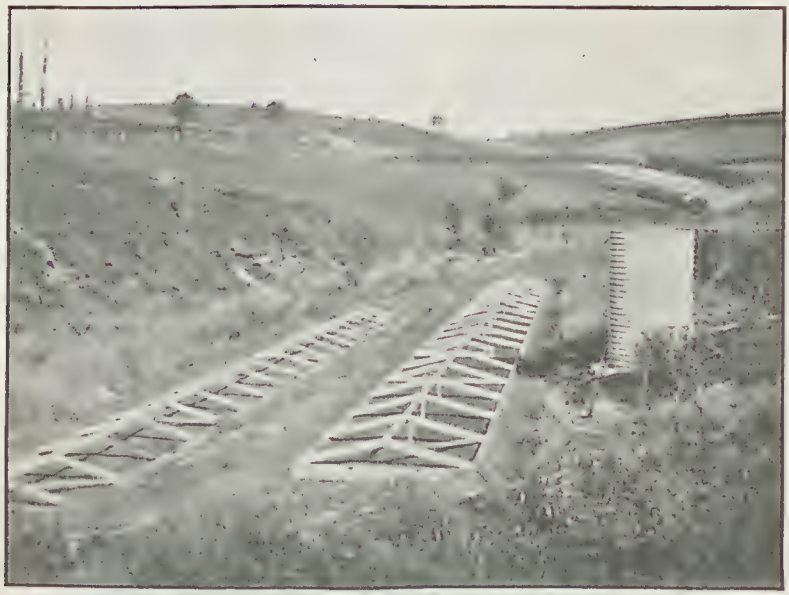


Plate 5.—Nursery Frames in which Phormium Plants are raised.

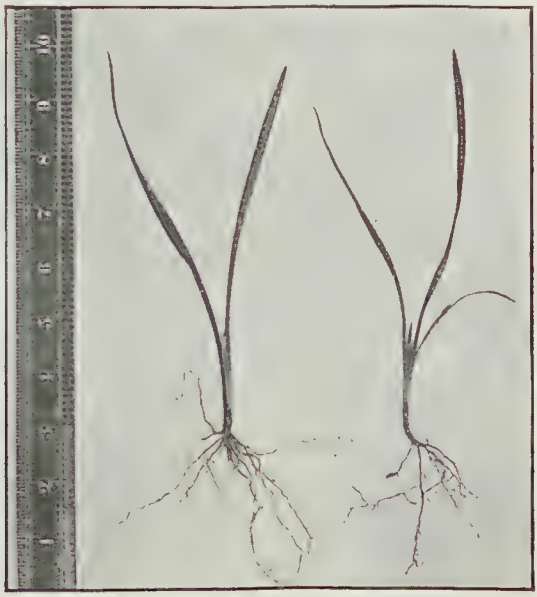


Plate 6.—Seedlings: First Year's Growth.

water for this purpose is obtained from the mill supply, which was diverted from its natural course in the creek below the frames, by

means of a channel, to the level of the 1-in. supply pipe above the tank. The soil under the frames, being a creek siltation, is rich; nevertheless, the seedlings make slow growth during the first year, few attaining a height of more than 8 inches. The seedlings grow thickly in the first nursery bed, and 350,000 were raised in four frames last year. When transplanted, after the first period of growth, about 4 inches apart, in a new situation, the plants are, in a year or two, enabled to become sufficiently developed to take up their permanent positions in the flax field.

Plate 6 illustrates two seedlings, first year's growth, lifted from the nursery bed for transplanting. Emerald is undulating country, the soil being of volcanic origin, red, deep and fairly rich, but rather loose in texture. The annual rainfall for the district is heavy, but owing to the porous nature of this soil, especially if left uncultivated, it loses its

Plate 7.—Bed of Seedlings: Two Years Old.

moisture quickly when the warm, dry weather sets in, but retains its capillary moisture fairly well under intensive cultural treatment.

As the flax-fields are being enlarged, the portions involved in the extensions are cleared of all nursery trees and thoroughly cultivated so as to offer an ideal soil condition to the young Phormium plants. The first section was planted 2 ft. x 2 ft., but experience has since taught that in this method the plants are too close to each other, and 4 ft. x 4 ft. has been adopted in subsequent plantings. The soil between the rows is kept cultivated until the bushes become thoroughly established. It is obvious that the more genial the conditions of growth the greater would be the quantity of green Phormium produced on a given area, and the fibre would increase in length and improve in quality at the same ratio. To achieve this object on the hilly land, it may be possible to accumulate

and conserve water for the planted areas later on. The 6 ft. x 6 ft. principle might with advantage be adopted if artificial watering were provided. It will be conceded that, under the conditions explained, irrigation may be regarded as the chief factor in the creation of a more genial association of ideals under which the Phormium would thrive better than is the case while dependent on natural soil moisture.

Plate 8.—Section of a Divided Plant.

Owing to the different varieties of Phormium not being of "fixed" types, and because of the influence of inter-pollination, the seeds collected even from the best plants in the flax-field usually produce seedlings showing great diversification, differing from each other in habit of growth, length of leaf and quality of fibre, &c. This difficulty may be overcome, however, and regularity of the bushes secured and maintained,

provided the soil in the planted area be of uniform fertility, by using the divided roots of selected plants in the same way as buds and scions instead of seeds, are employed in the propagation of the different varieties of fruit trees, &c. Thus the tendency to "throw back" or produce new varieties, a large percentage of which are usually of inferior quality, is prevented and the desired variety preserved.

Plate 9.—Structure of Root System of Phormium Tenax.

The illustration in Plate 7* shows a bed of two-year-old seedlings, grown by the officer in charge of the gardens of the City Corporation, on the banks of the Yarra. These were raised in boxes and on reaching a certain stage were potted out, and after remaining some time in the pots they were sown in the beds as shown in the illustration. These plants were used for ornamental purposes in the gardens and reserves under the control of the City Corporation.

* From an article on New Zealand Flax by thelate Mr. Joseph Knight, published in the *Journal of Agriculture*, Victoria, June, 1906.

Plate 10.—Field of New Zealand Flax, having arrived at Maturity and ready for Cutting.

When planting, the plant is placed in a shallow hole, 4 or 5 inches deep and the fibrous roots spread out and the soil when replaced well tramped down. Then the outside leaves should be cut back, but not the younger ones on the inside of the fan. The Autumn is regarded as the most suitable season for planting, as the young plants are enabled to establish, to some extent, their root systems before Winter sets in, and this facilitates good growth during the following Spring.

Plate 8 illustrates a section ready for transplanting, and a large bush of Phormium when carefully divided up may yield from 40 to 50 such roots. Hector advises that, when selecting roots, care should be taken to avoid those from which the seed-stems have been thrown out, or planting the centre portions of old plants, which are not so productive as young shoots, because they have a tendency to run to flowers.

In advocating the use of divided bushes in establishing flax-fields, and for the reasons explained, it is not suggested that the production of seedlings should be totally suspended. Phormium, like other plants, is susceptible to improvement by plant breeding as well as by cultural treatment, therefore, varieties of even better quality and more suitable to Australian conditions might be quickly evolved through the scientific production and treatment of seedlings.

Plate 9* shows the structure of the root system of the Phormium, and illustrates the mode of growth and propagation.

A.—Section of compound rhizome or prostrate stem of *Phormium tenax,* showing—*a* main axis or central stem, from which the flower-stalk (the terminal axis of the plant) has been given off at *b*. *c* Lateral shoots forming new leaf-buds, and, ultimately, fans that accumulate nourishment at the base of their leaves, throw out rootlets, and finally become independent of the parent leaf, as at *d*. *e* First stage of buds from which lateral shoots spring.

B.—Section of root of *Phormium tenax* in best condition for transplanting, showing—*a* mass of fibrous, starchy, and resinous matter accumulated for the nourishment of the future flower-stalk and lateral buds. *b* Cortex layer, formed from the bases of the old leaves. *c* Rootlets.

C.—Underground stem of Manunu (one of the best varieties of *Phormium tenax*) showing—*a* main axis that has flowered and completed its life. *b* Lateral shoot by which life of the plant is continued.

When the planting of the different sections of the flax-field is completed, these should receive special attention during the following period of growth, and any sickly plants dying out should be replaced by healthy ones to maintain uniformity and insure the best results being obtained. The area under flax shown in Plate 10 illustrates uniformity of growth and shows that the Phormium has arrived at maturity and is ready to be cut. The plants thrive better in secluded positions than when exposed to severe winds, but if carefully managed for a year or two they are enabled to develop sufficiently to afford themselves the necessary shelter.

(To be continued.)

* From Sir James Hector's work on *Phormium tenax.*

SMALL FRUIT CULTURE.

(Continued from Page 600.)

By A. A. Hammond, Orchard Supervisor.

THE RASPBERRY.

The European raspberry was probably the first of the brambles cultivated. Its history dates back for more than 2,000 years. Its specific name (*idæus*) is derived from Mount Ida in Asia Minor, where it is recorded as growing wild before the Christian era. It is, however, indigenous to the greater part of Europe and Northern Asia, and has been described by the early Greek and Roman historians. As a desert fruit or for making preserves or jam, the raspberry has always been highly prized and is still the most favoured of the bramble berries.

The raspberry has been cultivated in Victoria since the early days of the Colony, but owing to the low prices ruling some few years ago and the ravages of the fungus—*Hypholoma fasicularé*—many plantations were uprooted. No new plantations were established, and those in existence deteriorated through age and neglect. Of recent years there has been a considerable advance in the price of this berry, and the supply has not been equal to the demand, despite the fact that the lawton and logan berries have appeared as rivals in the field.

The European red raspberry was introduced to America at the beginning of raspberry culture in that country, but it was soon found that the native American species were equally good and much more profitable. Notwithstanding the reputation of the European species, it was soon pushed into the background and is not now commercially cultivated in America. Here, however, the American species have so far proved unprofitable. The leading commercial variety in America is the Cuthbert, but in this State, although it makes a vigorous growth and is hardy, it is a poor bearer and is consequently not in favour with commercial raspberry-growers.

The varieties commonly grown in Victoria are all of European origin. Several promising seedlings of European varieties have been raised in Tasmania and Victoria, and, doubtless, more attention would have been given to the raising of seedlings but for the stagnation which obtained until quite recently in berry culture.

Range of Successful Cultivation.

The raspberry has a limited range of successful cultivation in Victoria. It may be possible to successfully grow a few plants almost anywhere in the State, providing they receive special care, but if grown commercially on a fairly large scale, the climatic and soil conditions must be suitable.

Climate.

The raspberry thrives best in a cool, moist climate, such as usually obtains in the hilly, timbered districts of Southern Victoria. Most brambles prefer a cool, moist climate, but with the raspberry such a climate is essential to its successful growth. It would be a waste of

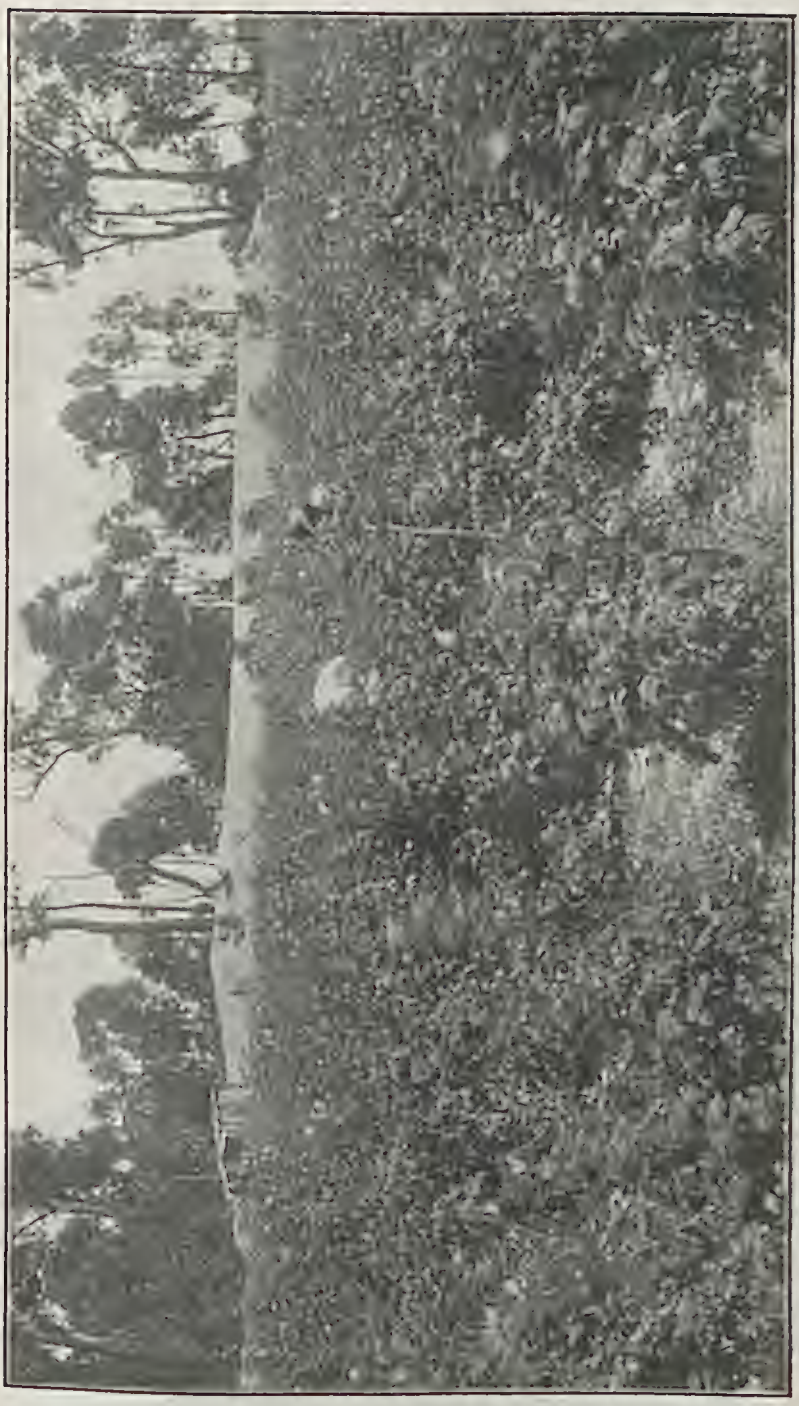


Figure 13.—Plantation of Antwerp Raspberries with Dam at Back.
(Aspect, south-east. Well sheltered from north and west.)

time and energy to attempt to grow this berry in the dry and warm northern districts, and even in the southern districts the localities which have the requirements of shelter, soil, and aspect are few.

Soil.

Raspberries, like all the brambles, delight in a deep, moist, well-aerated loam, rich in humus. Good drainage is essential, without which aeration of the soil and the retention of capillary water is impossible. A shallow soil with a heavy clay subsoil must be avoided. A soil such as is found in the Wandin and Monbulk districts suits the raspberry admirably. There, even in midwinter, one can dig a hole 18 inches deep and the soil is almost as friable and loose at the bottom as at the surface. Where the natural drainage is good, as it usually is in the districts mentioned, this class of soil retains its moisture well in the summer and never becomes water-logged in the winter.

Site.

In choosing a site the question of aspect and shelter is of prime importance. The land should slope to the south-east or south, and the north and north-west sides must be protected by a breakwind. The taller the trees forming the breakwind the better, as they will afford the plantation not only shelter from the hot north winds, but their shade will give a large portion of it protection from the hot sun during the greater part of the afternoon. The raspberry is a shade-loving plant, and this is shown by the plants which receive the most protection from the hot afternoon sun being the most thrifty and productive.

In Figure 13 a plantation of red Antwerp raspberries is shown. This plantation has the desired aspect, is sheltered by a belt of forest trees, and is typical of the most successful plantations in the Wandin district. The advantages of a southerly aspect are that the soil is cooler and retains its moisture better in the summer and that shelter from the scorching hot winds and afternoon sun is made possible.

Propagation.

Suckers are thrown up by the parent plants, and these are lifted, the roots trimmed, and planted out where required. The suckers may be lifted at any time during winter or early spring before the sap begins to move. In loose, friable soil the suckers can be pulled out in winter with little or no injury to the roots. If, however, there is a danger of breaking the roots they should be lifted with a spade.

In discussing the lawtonberry it was advised to select suckers from a fruitful plant. In repeating that advice in connexion with raspberries, it may be mentioned that a leading grower at Wandin attributed the infertility of the plants in many raspberry plantations to the selection of suckers from unfruitful plants. While the selection of strong, well-grown suckers is recommended, it must be borne in mind that unfruitful plants are those which are likely to throw up the most vigorous suckers. Heredity obtains in plants as in animals, and plants obtained from unfruitful parents will very probably prove unfruitful. Therefore, a choice must be made of the most vigorous suckers from fruitful plants. It is well to remember that seedlings often spring up between the rows. These should not be mistaken for

suckers, as plants do not come true from seed and would probably be inferior to the parent plant.

Planting.

Planting may be done at any time after the leaves fall till early spring. Spring planting is generally favoured. The land should be well prepared, as advised for loganberries, and left lie in a rough condition for several months to sweeten.

On no account should raspberries be planted on other than virgin soil. Planted on old land they invariably prove a failure.

The worst disease with which raspberry-growers have to contend is the fungus known as *Hypholoma fasiculare*. This fungus is a saprophyte as well as a parasite, that is, it can live either on dead wood or a living plant. When clearing the land for a raspberry plantation all roots, as far as possible, should be removed and dead stumps burnt out if possible; otherwise the fungus which lives on the dead wood will infect the young plants.

In planting, furrows may be opened out 5 feet apart, as previously described, and the suckers planted in sets of four at a distance of 4 feet apart. Care must be taken when planting not to injure the young stools, which, if planting is done in spring, will have started to grow. It is advisable to plant a little deeper than the bramble originally grew. After planting, the canes should be cut back to about 3 or 4 inches from the ground, leaving sufficient cane to show where the sets have been planted. A handful of bone and super. mixed applied at planting, but not in direct contact with the roots, gives the young brambles a start.

Cultivation and Irrigation.

Summer cultivation is very important, especially till the berries are harvested. When the sets are planted 5 feet x 4 feet or 5 feet x 5 feet, the cultivator can be worked between and across the rows. After rain or irrigation the cultivator should be kept going to prevent evaporation and to destroy weeds and suckers. When suckers are required for planting out, summer cultivation, of course, cannot be practised as advised without injury to the young plants. What has been written in respect to irrigation of loganberries applies also to the raspberry.

The majority of Wandin growers find it necessary to irrigate their plantation two or three times during the summer. The number of waterings depends on the season and the nature of the soil. It also depends on cultivation for the conservation of moisture. Irrigation can easily be overdone, and it is a mistake to suppose that additional waterings will compensate for the neglect of cultivation.

Manuring.

As previously mentioned, soil rich in humus is required for raspberries. When this is deficient, stable manure or other organic fertilizer should be used. In any case, organic fertilizers are the best for brambles. The use of stable manure and green manuring has been discussed in connexion with loganberry culture and need not be repeated here. When the physical condition of the soil is good, artificial manures may be used with advantage every alternate season. A mixture of bone dust, superphosphate, and potash contain the essential plant foods which are likely to be deficient in most soils.

The value of sulphur as a fungicide is well known. It is not, however, generally known that the application of sulphur to a soil rich in organic matter increases considerably its fertility. Sulphur stimulates bacterial activity, thereby causing the liberation of certain plant foods which would otherwise remain unavailable.

In an article in Part 5, Vol. XII. (May, 1914) of this Journal Mr. de Castella gives the results of some experiments conducted in France. These go to show that when sulphur was added to a dressing of organic and other manures the yield of vines was increased by 9.2 to 35.64 per cent.

The application of sulphur to raspberries would be well worth a trial, as a dressing of this fungicide would very probably help to rid the soil of the raspberry root fungus which is, and has been for many years, the bane of growers in the Wandin district.

In the French experiments 180 to 360 lbs. of sulphur per acre was used.

Pruning and Training.

Should the canes which are produced the season following planting be weak and spindling, it is best to cut them back at the winter pruning and prevent their fruiting. When the canes make fair growth the strongest are kept and all weakly ones cut out close to the crown. The canes retained are plaited together as shown in Figure 14, and tied at the top. When canes are being plaited it is advisable to bow them slightly. This makes them more rigid and capable of carrying their fruit without being bent to the ground. The topping of the canes is the next operation. The height at which they should be topped depends on the length and strength of the cane, but usually the cutting off of a few inches is sufficient. The old canes should be cut out close to the crown immediately after the berries are harvested. This is specially necessary if they are affected with scale or other disease. All prunings should be burnt as soon as possible. The usual practice, however, is to defer the cutting out of canes that have fruited till winter, when all the work of cutting out, pruning, plaiting, and tying up is done.

In handling thorny varieties leather gloves are necessary, but if the work is done when the canes are wet they can be handled without injury to the hands.

The question of summer topping, especially in regard to the American species, has been much debated. Speaking generally, the practice is not to be recommended. Pinching the tops of canes during their growth in early summer stiffens them and causes laterals to be thrown out. If these growths are weak, more harm than good is done. When canes are very vigorous this pinching back prevents their growing too high and tends to ripen the wood. This is rarely, if ever, necessary with European varieties.

Harvesting and Marketing.

Raspberries ripen at the hottest time of the year, and the harvesting of berries is an anxious and busy time for the grower. When picking for sale in the fresh fruit market the brambles should be gone over every alternate day. When intended for the factory or for jam, two pickings a week is sufficient.

When berries are fully ripe they should be gathered, if possible, in the cool of the morning. At this time they are firm to handle and

separate readily from the stem. In the heat of the day they crush easily and can be detached from the stem only with difficulty.

Figure 14.—(*a*) Raspberry before being Pruned, Tied, and Topped (Note Old Canes tied in the Centre of Bush).
(*b*) Same Plant after being Pruned, Tied, and Topped.

Berries should never be harvested when wet. As soon as gathered they should be placed in the shade and kept in a cool, well-ventilated place until sent to the market. Raspberries are harvested and marketed in containers similar to those used for loganberries.

Varieties.

The Red Antwerp, known as the Common Red raspberry, is more extensively grown than any other variety. It is considered the best jam variety because of its colour and flavour. Northumberland Fillbasket is a good market variety. It is darker in colour than Red Antwerp, and for that reason is not liked so well for jam. Fillbasket Thornless

Figura 15.— A Corner of a Raspberry Garden.

and Hunter's Perfection are sub-varieties of the Northumberland Fillbasket and similar in every respect except that the canes are thornless.

Cuthbert or Queen of the Market was introduced from America with a great reputation. It belongs to one of the native American species. It is a strong grower and hardy, but in the Wandin district it has proved to be a very poor cropper. It has a habit of bearing on the tips of the current season's cane. The berries which ripen in autumn are of good quality, but growers do not place much value on the crop.

Fastolf is another good jam variety, but is not much grown commercially. As previously mentioned, there are several Tasmanian varieties which are seedlings of European varieties. Some of these promise well and appear to be worthy of more extensive cultivation. Owing, however, to the stagnation in berry culture until quite recent years, growers took but little interest in the propagation and cultivation of new varieties.

There are also several varieties of raspberries catalogued which would doubtless be valuable for private gardens, such as the Everbearing, which continues fruiting all summer. This is no advantage to the commercial grower, who desires to get his fruit harvested as quickly as possible and have done with it.

(*To be continued.*)

SORGHUM FOR SYRUP.

Sugar at 30 cents a pound and prices mounting daily bring to mind again this year the old sorghum mill and the opportunity it offers of relieving the desire for sweets that otherwise may go unsatisfied. To meet the craving for information the Wisconsin Agricultural Experiment Station has just issued a new bulletin in which much information is given concerning the sorghum industry, how the plant is raised, and how the syrup is manufactured.

Sorghum has been grown and manufactured into syrup in Wisconsin for sixty years. The annual production of syrup for the last fifty years has ranged from 200,000 to a little more than 300,000 gallons. In 1919 more than 225,000 gallons were produced.

Sorghum will mature in any section where dent corn will mature. It will grow on any reasonably fertile soil that is well drained. Soils that will produce corn will produce sorghum. It is particularly adapted to sandy lands, as it withstands drought better than any other inter-tilled crop. It does not exhaust the fertility of the soil any more rapidly than do other inter-tilled crops.

Sorghum yields from 8 to 15 tons of green material to the acre, from which 70 to 150 gallons of syrup can be manufactured. There has been an active demand for the syrup, and practically all of it has been consumed in the community where it is produced.

Sorghum should be planted at about the same time or just after corn. The Amber variety requires 105 to 120 days to mature, and to be out of danger of frost should be ready to cut from 1st to 15th September. It may be planted in hills 16 to 24 inches apart in the row, with 36 to 44 inches between rows. When planted in check rows, the rows are usually 36 to 40 inches apart. Three to four plants to a hill, or four to five when check-rowed, is about the right stand for best production. The corn planter with special seed plates may be used or the seed put in by hand with a hoe.

Sorghum is not vigorous when germinating and when the plants are young, consequently plenty of seed should be used and the plants thinned out later. Three to four pounds of seed to the acre will provide plenty of plants. Plant just deep enough to cover the seed and avoid deep planting.—*Hoard's Dairyman,* 4th June, 1920.

SPRING GRAFTING OF OLD-ESTABLISHED VINES.

(Continued from page 614.)

By F. de Castella, Government Viticulturist.

Whether grafting old viniferas or re-grafting resistant stocks previously grafted with another vinifera scion, the method does not radically differ from that described for the field grafting of young resistant stocks planted a season previously (see *Journals* September and October, 1917), but allowance must, of course, be made for the considerable difference between the diameters of stock and scion.

As will be seen in Figure 1, the stock is cut off at, or slightly above the ground level and split with a suitable tool; into the cleft thus formed, the scion, trimmed to a wedge, exactly as previously described, is carefully fitted in such a way that the cambium* sections of stock

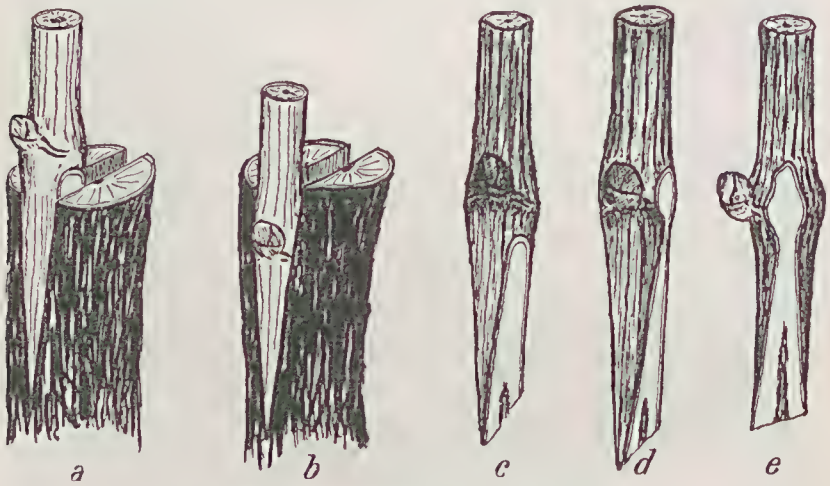


Figure 1.—Field Grafting Old Vines.

(a) Usual method. (b) Same with scion inserted rather more deeply. (c) Usual way of trimming scion. (d) and (e) Alternative method not now in general use.

and scion are in contact on one side of the graft (the front) in the greatest measure possible. The bark of old stocks being much thicker than that of the scions to be fitted on them, ample allowance must be made for this difference. It is not the *outside* but the *inside* of the barks which must correspond.

This disproportion in the sizes permits a good deal of latitude. There are different methods of grafting large stocks, and on several important points authorities are far from being in agreement. Some favour complete splitting of the stock, whilst others advise partial splitting. In the former case, and if the stock be large enough, two scions may be fitted; one at the front and one at the back of the cleft.

* The cambium is the thin layer of green generative tissue which everywhere separates the inner bark from the wood of the the vine. It is the only portion of the cut surfaces of stock and scion where new tissues can form. Unless the cambium sections of stock and scion are in contact at least at one point no union is possible, and the graft must fail.

The cleft may be diametrical, passing through the pith (Figure 1) or oblique and to one side of it. Scions with one, two, or even three eyes may be fitted. Several ingenious methods of grafting the vine have been devised, but the present article must be limited to cleft-grafting, which is the most usual and practical one.

When to Graft—Cutting back the Stock.

Old vines can, with advantage, be grafted earlier in the season than is usual when field-grafting young resistant stocks in the vineyard. The best moment seems to be when the sap first commences to move, or even slightly before this—in other words—towards the end of August. This largely depends, however, on weather conditions. It must be remembered that excessive moisture is the greatest obstacle to success in grafting; hence, in a wet spring it is better to await finer weather and graft somewhat later, even if the operation has to be postponed until October. It will then be necessary to cut the stock back several days before grafting it. When the vine is sprouting copious "bleeding"

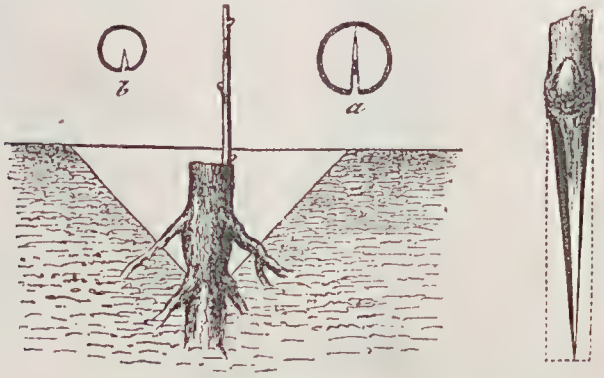


Figure 2.—Grafting Very Large Vines.
The stock is split partially, i.e., not right across.

follows the cutting back of the stock. If grafted immediately, "drowning" of the scion is to be feared. Whether the excessive moisture comes from rain or from the stock itself, the evil effects are the same—callusing only takes place in moderately moist air and at the requisite temperature (above 60° F.); it does not form at all under water. By cutting back the sprouting stock a few days previously, and only fitting the scion after bleeding has ceased, this danger is avoided. Weather conditions should thus decide the exact moment for grafting old vines. In a dry spring graft early; even before the first rise of the sap. In a wet spring graft later, but cut back the stock a week before fitting the scion.

The point at which the stock should be cut back—whether above or below ground—is also of importance. In the case of re-grafting vines on resistant stocks, the danger of scion roots makes it advisable to graft as high as convenient. This is, in fact, one of the arguments in favour of supergrafting. A high mound will always afford ample protection, even if the graft be several inches above soil level. When

grafting viniferas on their own roots, the danger of phylloxera does not enter into the question; it might in this case appear preferable to graft at a greater depth. In the familiar figure to be seen in most French text-books (Figure 2), the stock is cut back slightly below soil level. Even in pre-phylloxera days, however, scion roots were considered rather a disadvantage than otherwise. They do not become really strong, and it is better that the grafted vine should obtain its soil requirements through the more powerful roots of the stock.

If the stock is cut off below ground, the danger of moisture in excess is increased. Even when grafting old viniferas, there does not seem to be any reason to operate much below the surface. The stock is

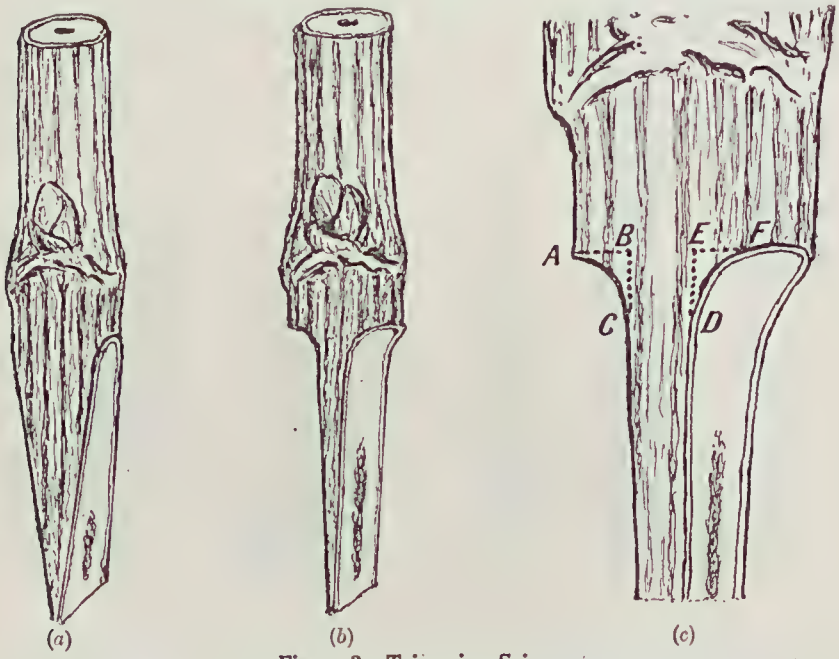


Figure 3.—Trimming Scion.

Note plane section (a) as opposed to curved sections (b). (c) "Shouldering the scion."

usually "beheaded" with a saw, care being taken to cut it off cleanly and in such a way that the cambium layer is not damaged on the side where the scion will be fitted.

Scion Requirements.

These are much the same as in the case of ordinary field-grafting. Careful selection is imperative. The cuttings must also be in a dormant state when grafted. With early grafting they are usually in a fit condition, but when grafting is postponed to a later date the scions must be kept back, either by stratifying in almost dry sand in a cellar or cool shed, or by cool storage in an orchard cool store or a butter factory at a temperature of about 40° F. In this way they may be kept back for a considerable period. Before grafting, cuttings which

are to serve as scions should be placed for about a day with their butts in clean water, in order to make good any moisture lost in storage.

The scion may be trimmed in various ways, the most usual being that shown at a (Figure 3). In other words, to an elongated wedge or bevel, slightly thicker on the outside or bud side than on the inside, in order to better secure contact of the cambium sections. When cutting the bevel, care must be taken to prevent the knife engaging too deeply at first; the sections should be perfectly plane, as shown at a and not as at b (Figure 3). The bevel shown at a, drawn to illustrate the difference between plane and curved sections, is rather too short. With large stocks, a bevel two to three times as long is usual, otherwise the cleft would be forced too widely open. Sometimes the scion is "shouldered," in which case it should at first be trimmed as at b, the shoulders being completed by four cuts of the knife shown at AB, BC, DE, and FE (c Figure 3). The advantages of shouldering are that the stock need not be so widely split when inserting the scion and very neat fitting of the cambium sections.

In France a special tool is obtainable with which scions can rapidly and accurately be prepared in this way.

Trimming the scion, as shown at d and e (Figure 1), was suggested some years ago as an improvement. It seems to be a revival of a method recommended by Palladius nearly 2,000 years ago. Though it multiplies the points where the cambium sections of stock and scion meet, it necessitates cutting into the swelling situated near the bud, which seems to be impoverished thereby. This special method is not generally practised nowadays.

The number of buds carried by the scion varies from one to three. Authorities are not in agreement as to the best number. Strictly speaking, one eye should suffice, but a scion with two eyes is generally preferable, especially if one scion only is to be fitted, since it provides a second shoot in case of damage to the first one. If two scions are inserted, they may be limited to one eye each, though there is no objection to their having two eyes each, unless in the case of very long jointed wood. Scions with three eyes are seldom used.

The Actual Graft.

If the stock was cut back some days previously so as to avoid "bleeding" trouble, the cut surface should be "refreshed" by a fresh cut half-an-inch lower down or by paring the previous section with a sharp knife. It must then be split in order to make the cleft to receive the scion. A heavy knife specially made for the purpose is convenient. This can be forced in, to the required depth, by gentle tapping with a hammer or light mallet. An ordinary shingle hammer or small tomahawk may also be used. The proper depth for the cleft depends on the length of the wedge or bevel to which the scion is trimmed, and this in turn is regulated by the diameter of the scion. On no account should the stock be split too deeply. This is one of the commonest mistakes made by beginners. Such a graft with cut surfaces properly in contact at the top of the cleft only, but with the apex of the scion "in the air," so to speak, is pre-doomed to failure. If union takes place at all, it will be faulty, the resulting vine short lived and unproductive. It is often possible to take advantage of a knot, or the

region where the first large roots branch off, as a check to the cleft penetrating too deeply.

On withdrawing the splitting tool the cleft closes up again; in order to conveniently fit the scion (or scions if there are two) a small wedge of bone or very hard wood will be found convenient. This is lightly driven in towards the centre of the cleft, which is thus re-opened sufficiently to receive the scions, each of which is pressed home exactly as described in the case of field-grafting (see *Journals* for September and October, 1917). Both scions having been fitted, the wedge is carefully withdrawn, when the spring of the stock will hold them so firmly that no tie is necessary. A small strip of paper or a fragment of moss or something similar can with advantage be placed between the two scions, to prevent soil particles from falling into the central part of the cleft, but plastering with grafting wax, clay, or similar preparations is not only unnecessary, but undesirable—such

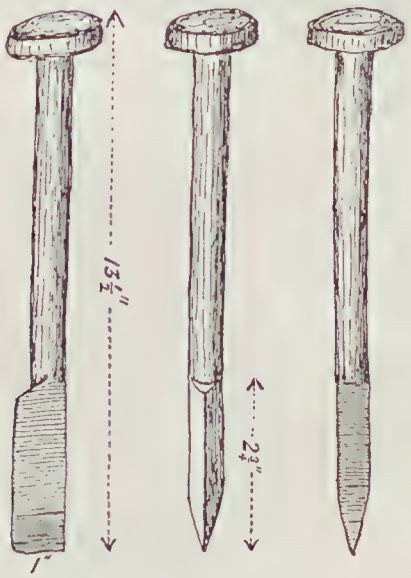


Figure 4.—Grafting Chisel.

substances tend to hinder callus formation rather than to promote it. A mound of loose, mellow soil provides all the protection required.

Should one or two scions be fitted? Authorities differ. Marès* holds that one is sufficient. Many other authorities recommend two, the one which makes the less satisfactory union being subsequently removed. Ravaz (*Progres Agricole*, 23rd March, 1919) recommends fittting two scions in order to obtain a better union.

With two scions the chances of success are doubled, but at the expense of a slight waste of time. Extra care is also necessary to insure both scions being equally tightly gripped by the stock when the wedge is withdrawn.

* See *Bulletin* No. 35 (new series), *The Summer Bud or Yema Graft of the Vine*, Figure 11, p. 21.

Partial Splitting of Stock.

Instead of splitting the stock right across, many authorities recommend partial splitting, as shown in Figure 2, an almost classical illustration, to be found in most French text-books. In this case only one scion can be inserted. For the execution of this graft, a special chisel is employed, which may be compared to a knife blade broken square across and sharpened where broken (Figure 4).

In making the cleft it is recommended to avoid touching with the steel of the chisel, the cambium sections where the scion will be fitted, and to so place the chisel before hammering it in that the sharp edge is near the pith of the stock (a, Figure 2); in other words, well away from the bark. The split thus made extends right out to the bark though the steel does not come into contact with this region. The chisel is made to play the part of the wedge previously mentioned, as it is left in the stock until after the insertion of the scion. Before this is fitted, a thin tapering shaving is taken off each side of the cleft with a sharp knife, operated from below upwards, and of a thickness proportionate to the size of the scion, so that when pushed home the latter exactly fills the cavity. On withdrawing the chisel the sides of the cleft close on the scion and hold it so tightly that no tie is necessary.

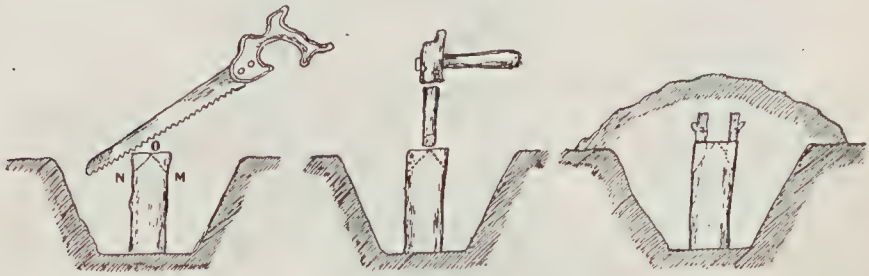


Figure 5.—Grafting with the Saw.

Saw Grafting.

The saw may be substituted for the chisel when making the cleft; such a course is described by Cadoret* as giving good results in the supergrafting of old vines—

> With well preserved scions grafting can easily be commenced during March and continued until May (September to November here). The vines are beheaded with the saw some days before grafting, to avoid excessive bleeding . . . . capable of drowning the scions.
>
> The incisions intended to receive the scions are made with the saw; they are given a length identical with that of the scion bevels. The grafter operates the saw in the directions OM, ON (Figure 5).
>
> To facilitate fitting the scions an iron wedge is driven in, as shown at B (Figure 5), to open the clefts.
>
> The scions, trimmed as for the ordinary cleft graft, are immediately fitted in their places; on withdrawing the wedge the clefts close up and firmly grip the scions, which need neither wax nor tie. A stake is then placed in position, the hole is filled, and the graft mounded with sand or loose soil. By this system a skilful workman can guarantee a take of 95 per cent, and over.

* *Livre de la Ferme* II., p. 206.

Saw-grafting has been successfully practised in this State.

When operating the saw care must be taken to avoid separating bark from wood, as may easily happen at grafting time, when the cambium layer is in a jelly-like condition if the vine is well in sap. The saw should not be worked to and fro; it should be pushed forward only, and lifted out of the cut each time instead of being drawn back through it.

Grafting Without Loss of Crop.

A graft bears little or no fruit the first year. In order to obviate the loss of crop which occurs when grafting in the ordinary way, several methods have been devised, which permit of the vine being grafted without immediately cutting back the stock, the upper part of which continues to yield grapes until the graft has reached fruiting age.

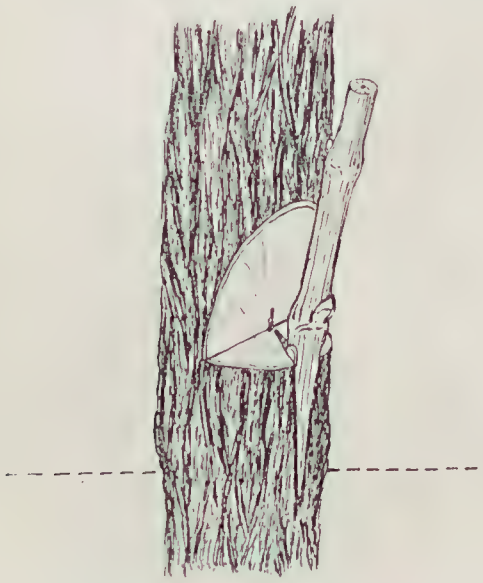


Figure 6.—"Gaillard's" Graft.
(The dotted line shows the ground level.)

One method, known in France as "Gaillard's" graft, will be readily understood on reference to Figure 6. A horizontal saw cut is first made, which penetrates to the pith. Cutting downwards with a broad chisel, a chip of wood is removed and a niche formed, at the edge of which a scion is cleft-grafted in the ordinary way.

A modification of this graft consists in making the cleft at right angles to the one shown in Figure 6, at or near the back of the niche. In this case two scions can be fitted, one at each side of the cleft, which extends from bark to bark.

Another graft of this class has recently been rather extensively practised in the Rutherglen district, where it is often known as the "butcher's knife" graft, since the stock is split with a stout knife to which, for more convenient working, a second handle is riveted. As

shown in Figure 7, the cleft is made by operating the knife diagonally downwards until a point is reached rather less than mid-way between bark and pith, the exact depth depending on the size of the stock. Into this cleft the scion, trimmed as previously described but with a rather longer bevel, is fitted, care being taken that cambium sections meet on one side; gently bending or forcing back the top of the vine to be grafted, facilitates insertion of the scion, which is held so firmly that tying is unnecessary. It will be seen that this side cleft-graft is really little else than a modification of the Cadillac graft.* The scion being fitted obliquely owing to its being of very much smaller diameter than the stock.

These grafts, like the ones previously described, are performed slightly above the surface of the ground (shown by the dotted line). They are protected until knitting is complete by a mound of loose soil.

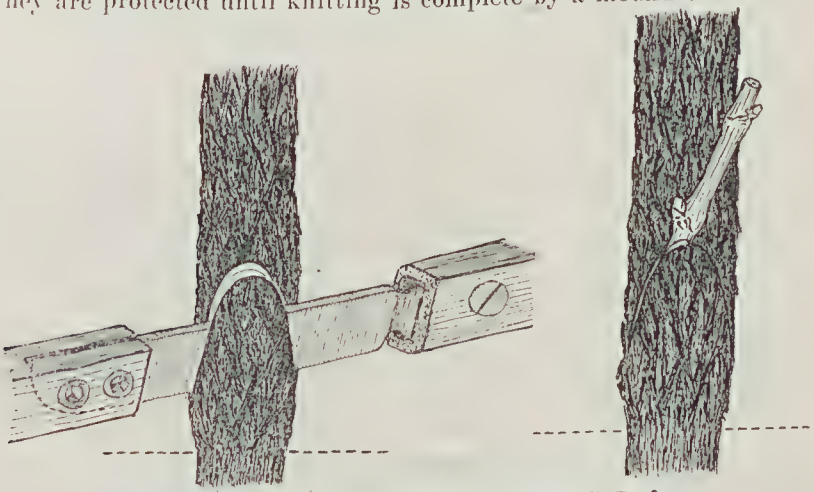


Figure 7.—Side Cleft or "Butcher's Knife" Graft.
(The dotted lines show the ground level.)

During the winter following the execution of the graft, the stock is sawn off slightly above the union. The scion, which has now reached fruiting age, receives the whole of the sap from the stock, and soon develops into a full-sized vine.

Attractive though such methods may at first sight appear, it is doubtful if the expected advantages are fully realized. Owing to the competition of the upper part of the original vine, the new scion makes rather poor growth during the first season—its development is not to be compared with that of an ordinary graft, which receives the whole of the sap supplied by the stock. It is, in fact, questionable if at the second season—after suppressing the original top part of the vine—it is in a sufficiently advanced state to yield a decent crop of grapes.

* *Progress Agricole*, 7th April, 1912.

TYPE: AND BURNLEY EGG-LAYING COMPETITION.

A. V. D. Rintoul, N.D.D., Chief Poultry Expert.

Reference has at times been made in this journal to the lack of type in the birds entered at the Burnley Egg-laying Competition. On page 690 are two illustrations of bird 148, Single Test, classed as a White Rhode Island. Breeders will at once see that this bird cannot possibly be recognised as a reasonable typical specimen, whilst the photograph of the head may serve as a reliable guide as to what should be avoided from the point of view of egg production. A hollow, sunken face, covered with feathers, and a coarse, heavy skull indicate the type of layer this bird is, with a total of eight eggs in the first six months. She already weighs over 9 lbs.

It will therefore be necessary to interpret more strictly in the future the rule that birds must be fair specimens of their respective breeds. An excellent system is in vogue at the egg-laying competition at Gatton College in Queensland, as is shown by Rule 7: "The Poultry Instructor shall examine all birds entered, and on 1st October declare whether they are true to type or not. Such as are passed will be eligible for the True to Type Prizes, and shall be so marked in all published records." That rule allows five months to elapse from the commencement of the competition, by which time all birds would be fully matured. As regards the True to Type Prizes, the following conditions have to be observed:—

1. It has to be recognised that birds are entered in the competition for test as to fecundity, with the ultimate object of using them as breeders. Hence all their characteristics have to be considered in the light of their possible transmission to the progeny.

2. To be true to type the birds must not possess any but breed characteristics. For example, side spikes in single combs or feathered legs in clean-legged varieties would be disqualifications. At the same time, any exaggeration of features, such as too large a comb in White Leghorns, would count against the bird just as much as a comb that was too small and erect. In the same way, medium values are required in many of the features, for it is fully recognised that the birds are for utility, not show purposes.

3. Because the birds are to be used for breeding, stamina is considered of vital importance, hence it has been deemed necessary to score the birds for stamina independently of type and conformation. In judging for stamina the general habits of the birds from four to six months' observation are utilized.

4. Each bird is judged separately, and the group of six birds finally classified as the aggregate of the six individuals. In this way a measure of the uniformity of the breeding is given.

5. For the type of the various breeds the standards of the Poultry Club of England have been taken as a basis, with the following modifications:—

Exaggeration of points is not allowed; the general conformation of the body has to comply with that essential wedge shape which is characteristic of the good layer.

The scale of points adopted is as follows:—

No. 1.—*Type and Conformation.*

Head—	
Comb	10 points.
Skull	5 „
Ear lobe	5 „
Face	5 „
	25 points.
Body	30 „
Size	25 „
Legs	10 „
Colour of plumage	10 „
	100 points.

No. 2.—*Stamina.*

Eye	15 points.
Head	20 „
Legs	15 „
Heart and lung room	15 „
Digestive capacity	15 „
Observation of general health and habits ..	20 „
	100 points.

Disqualifications.—Showing alien blood; inheritable characters, such as side spikes, feathering on shanks of clean-legged varieties, &c.; bodily deformities, including long tail, squirrel tail, crooked toes, &c. Any competitor found guilty of faking will be disqualified and debarred from entering future competitions.

Birds gaining seventy-five or more points in each of the standards will be placed in the first class. Any bird failing to obtain 50 per cent. of the points allocated for any one feature will be passed out.

In classifying the pens, the following rule is adopted:—If all birds are Class I., the pen is Class I. If one of the six birds does not pass, the pen is Class II. If two of the birds fail to pass, the pen is Class III. If more than two fail to pass, the pen is Class IV.

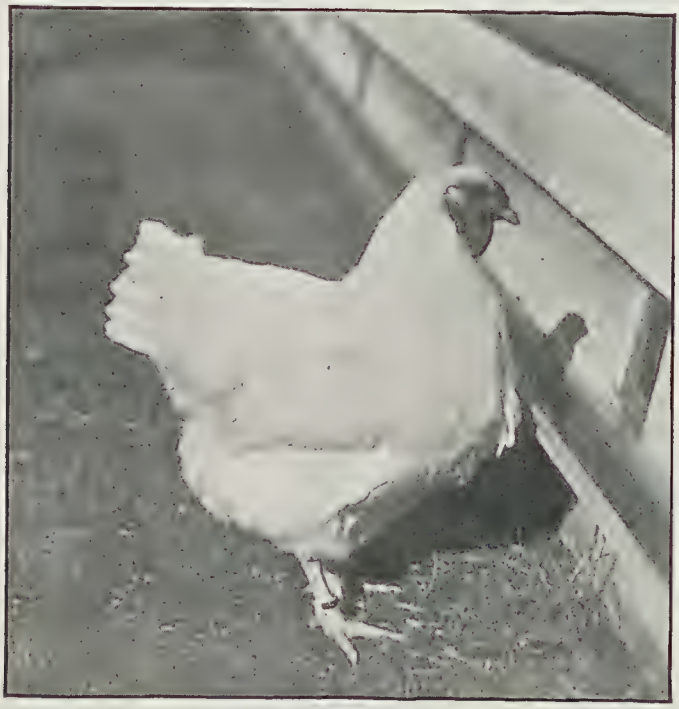
Only those placed in Class I. will be eligible for True to Type Prize. As regards the foregoing classification, it may be defined as follows:—

Class I. have passed, having answered all requirements in trueness to type.

Class II. have passed, but have faults which need rectifying in future breeding. These faults are fully detailed in the report by the expert in charge.

Class III. possess faults which will pass them out in the next competition, and the breeders must take drastic measures to improve same, otherwise they will not be accepted for future competition. The current competition admits this class.

Class IV. altogether fail to comply with the requirements, and, consequently, are passed out.



Bird entered in the Burnley Egg-laying Competitions as a White Rhode Island.

Head of Bird illustrated above.

It will be seen, therefore, that while a certain latitude is shown to competitors as regard the quality of birds that are allowed to enter the competition, by a process of grading only those of acknowledged approach to type can be admitted to compete for type prizes. *There is nothing in the standard of that type that is inimical to egg laying.* The time is fast approaching when considerable reforms will have to be adopted with regard to the judging of the so-called utility classes. Unfortunately, few of those regularly officiating as judges in utility classes have had any experience whatever with standard bred birds, and the results are, in consequence, at times somewhat unfortunate.

In the *Queensland Agricultural Journal* for May, 1919, the following appears:—

> "*Heavy Breeds.*—We have gone to the extent of leniency in classifying the heavy breeds, which, for the most part, consist of Black Orpingtons. Not only have breeders to make a big improvement in type, but the size of the eggs and tendency to broodiness have to be amended. There is a very great variety of type amongst the Orpingtons. There are birds with short backs, roach backs, finny backs, and those with cushions resembling those of a present-day Cochin. These backs finish off with an assorted variety of tails. There are true Orpington tails, long tails, and spread tails. Breeders of exhibition Orpingtons know too well the difficulty of producing blacks with that much desired green sheen, so too strict attention has not been given to this feature when passing verdict in this section. The required points of an Orpington are much harder to obtain than those of a Leghorn, hence, as previously remarked, more leniency has been shown in classifying in this breed.
>
> Side spikes on single combs are in evidence in too many cases for one's liking; it is a defect which is transmitted. Birds having this fault will be placed in the 4th Class in future competitions, and the same may be said of birds having feathers on their shanks in the clean-legged breeds. The combs on some of the Black Orpingtons are too large and hang to one side, so that if they possessed white lobes they would easily pass for a light breed. The build of some, with their long backs, tails, and legs, together with their fineness of bone, more resemble a light breed than a heavy one. The sooner the better it will be for all utility poultrymen when a thorough understanding is arrived at as to what constitutes the type, and the number of points to be allotted for each feature in all breeds for utility purposes, instead of one common standard, as issued by the Utility Poultry Club. The severe task of classifying 400 birds, the majority of which possess any number from three to a dozen failings on comparing them with the original standard, is a task not to be envied."

This critique of the Queensland birds might well have been written on the heavy breeds at Burnley this year. Unquestionably the worst feature of the current competition is the type of bird entered as White Rhode Island, but lack of type and lack of stamina are only too apparent in every section. Amongst the White Leghorns in single test, it would be no easy task to find a dozen fit to breed from. Good birds, fit to breed from, have never been more necessary than at the present time, and any tendency towards deterioration must be sternly opposed. The

value of the poultry industry to the State of Victoria is increasing enormously each year, and to maintain this progress and keep the way open for still further expansion the utmost care must be exercised with regard to type and stamina. Once again I would urge upon breeders the extreme folly of breeding from "score pedigrees" alone. That way leads to disaster.

The value of the poultry industry in Victoria for 1917-18 was £2,160,650; for 1918-19, £2,738,620; for 1919-20, £3,579,000; according to the figures available from the Government Statist. Surely an industry of over £3,500,000 a year is worthy of the utmost attention; yet quite recently in Melbourne it was entirely overlooked by the "Wake Up Victoria" League at their exhibition. At the time of my visit, though a great deal of space was devoted to coat sweaters and bottles of tomato sauce and pickles, it was only after a careful search that I was lucky enough to discover, sealed up in brown paper bags so that they could not be seen, 1 lb. of blood meal, two or three packets of parrot food, and several small packets of chicken food. All this to boom an industry of the value of over £3,500,000 in the past twelve months.

A shipment of eggs in the shell to Great Britain has just been made, some 500 cases of thirty dozen eggs to the case having been sent by Messrs. J. Cooke and Company, and the results of this shipment will be awaited with considerable interest, as the future expansion of the industry is largely dependent upon the overseas trade. Seeing that one Glasgow firm alone handles 2,000 tons of egg pulp a year, the opportunity for expansion is waiting for us. A decent flock average is 168 eggs per bird, the eggs should average 2 ozs. each, and nine eggs go to 1 lb. of egg pulp; each bird, therefore, should average 18⅔ lbs. of egg pulp. To produce 2,000 tons it would be necessary, therefore, to have 250,000 birds.

Egg Laying and its Relation to Type.

Up to comparatively few years ago, the term poultry fancier was only applied to those who had standard type fowls for exhibition purposes. Shows were numerous, and the classification most liberal, consequently an exhibitor could at times scoop forty or fifty prizes without perhaps meeting any opposition at all. The introduction of the egg-laying competitions, however, quickly stimulated a keen rivalry amongst breeders, the prizes for these competitions being awarded on actual results as regards production, and were in no way dependent upon the opinion of one man upon the actual outward appearance of the birds at the moment of judging; an opinion which at times might even be open to adverse criticism, as the decisive factor at exhibitions is the judge's interpretation of type.

What is Type?

Professor Rice says, "Type is the bird as seen and handled. We can determine and judge of her type by looking at her, and by physical examination."

Professor Lewis says, "Type means the form and function of the body, or plan of structure, as related to the formation of some special product; for example, egg or meat type."

Mr. Edward Brown, the eminent British authority, says, "To describe type is difficult, but it may be explaned as the combination of characters which give the race its individuality and distinguish it from others. Into type the shape, conformation, size, and carriage enter more fully than the coloration of plumage.

A Fine Type of White Leghorn.

Decisions Regarding Type.

The definition of correct type is almost invariably enunciated by the society or club interested in the welfare of the breed concerned, the committee of which lays down the standard. Hitherto the points comprising the standard have invariably described the outward, visible characteristics of outline, size, style, &c., with special reference to colour and plumage. The actual utility aspect as regards the profitable production of eggs and meat have not been directly referred to in any club standard.

Are the Club Standards Practicable for Utility Purposes?

Whilst any reply to the foregoing question undoubtedly admits of discussion, in my own opinion, the correct answer should be, "Yes, provided that the standard is interpreted reasonably without extreme exaggeration." No one, I hope, would be so indiscreet as to say that for

egg production type can be ignored, and that so long as a high score in a competition is achieved, nothing else matters. The distinguishing features of the various breeds would, at that rate, be ere long obliterated, deterioration and degeneracy would set in, confusion and disaster would result.

There are faults on both sides; the "utility" man and the "exhibitor" are equally to blame. The "utility" breeder, as he terms himself, must ignore score alone, without regard to size or conformation; the "exhibitor" must always bear in mind that the main advantage of the domestication of poultry is the usefulness so far as man is concerned. For example, the standard weight of the Orpington pullet is 7 lbs., that is, for the female just under twelve months old. At Burnley egg-laying competition it is necessary for Orpingtons to weigh 5 lbs. at the close of the first four months' laying, by which time they are presumably ten to eleven months old. I have seen so-called Black Orpingtons in public competition that could barely draw 4 lbs., several birds lately being disqualified at Burnley that weighed about 4 lbs. 10 ozs. each. Victorians, however, are not alone to blame in these matters, as I was present several years ago at the arrival of a small consignment of White Leghorns from a well-known American experimental station to one of our then foremost breeders, and the cockerel was about the poorest specimen ever seen outside the meat salesrooms. (Perhaps some other bird had been substituted *en route* for the original cockerel.) The one that arrived had an over 300-egg pedigree, with an atrocious squirrel tail, which had at times a tendency to wry tail. The illustration on page 693 from the *Reliable Poultry Journal* is by their famous artist, Mr. F. L. Sewell. This bird is bred from the most successful White Leghorn yard in the American show world, and has no point anywhere which could possibly—from the photograph—be considered at variance with the highest class "utility" stock.

(*To be continued.*)

Heredity doubtless plays a strong part in connexion with the temperament of cattle, and it is worthy of careful consideration by all breeders; but in too many cases nervousness and bad temper are the result of mismanagement and rough, if not actually cruel, treatment.

The selection and maintenance of the herd, gentle, regular, and punctual treatment of the animals throughout the year, provision of sufficient wholesome food for them, and abundant water, with frequent changes of pasturage when in milk, are some of the special maxims of successful dairying.

CURING YELLOW TOBACCO.

Temple A. J. Smith, Tobacco Expert.

The introduction of flue curing in place of the old system of sun and air curing tobacco leaf means considerably more than a change of method in the curing process if the best results are to be obtained, and growers in the future will find it necessary to seek lighter soils and new varieties suited to the production of bright aromatic types and cigarette tobaccoes in order that the best quality leaf in these kinds of tobacco may be grown.

In the past little or no encouragement was given to induce growers of tobacco to aim at high quality, the prices offered being much the same for all types, with the result that more attention was devoted to the production of heavy-grade tobacco which gave large yields. Many of these are quite unsuitable for flue curing, and can only be classed as dark tobacco, which, though improved by flue curing, will never make good cigarette or bright plug leaf, the texture being too coarse, the flavour too strong, and the colour too dark.

In spite of the disadvantages under which flue curing was carried on in the past season, sufficient indications were forthcoming to show that, given the right soils and varieties, the lighter types can be successfully grown, and, in fact, are being grown in some cases. Those who adopted flue curing are unanimous that they are on right lines, and many intend experimenting with more suitable soils and varieties for the higher class leaf in the coming season.

Soils best adapted for cigarette tobacco production are light, sandy, and porous. In Carolina, America, where some of the best yellow leaf is grown, 93 per cent. of the soil is composed of sand. In Tennessee, on poor white ridges, it is the same. On these soils now a little manure is used sufficient to bring the plant to maturity, when it begins to die away and turn yellow in the field. By closer planting on somewhat better soils the same effect may be obtained, which ,in other words, means taxing the land to produce as much as is possible, the effect being to induce finer texture and flavour, the colour also being brighter. Planting close in the field causes the crop to ripen earlier and more evenly, which is a distinct advantage where flue curing is the system followed.

The varieties most used for bright leaf are Yellow Pryor, Warne, White Stem Oronoco, Hester, and on suitable soils, Conqueror, and Lacks. Experience only will prove which of these will produce the best types of leaf in each particular soil, and it is quite probable that even adjoining farms will in time grow their own special types, as soils vary greatly in most districts. This has been amply proved in America, where districts only a few miles apart have become famous for widely different special types of tobacco leaf.

Formulas for flue curing vary, and no set rule can be laid down for curing all kinds of bright tobacco, though the basis from which the different systems have evolved is the same for all.

The first process after the ripe tobacco has been harvested and on the same day carted to the barn, is known as yellowing, which re-

quires from twenty-four hours to thirty-six hours, and sometimes longer, during which period slight fermentation takes place, and also certain chemical changes in the leaf itself. During this period the vents are closed and the temperature kept at from 85° F. to 100° F. until the leaf sweats, vents being opened top and bottom after the sweat has taken place. The leaf at this stage should have assumed a yellow colour, and the changes required to improve the smoking quality have taken place.

The next stage of the cure is to fix the yellow colour by driving off the moisture content in the leaf just so fast as it is given off. If the temperatures are increased too fast without sufficient ventilation the tobacco is liable to splotch, that is, the moisture driven out of the leaf is not carried away fast enough, but settles on the face of the leaf, making brown patches. If too slowly raised, the leaf will, by oxidation, turn brown or red; if too fast with ventilation, scorching sometimes occurs. This is the critical part of the cure, and as various tobaccoes may contain more or less moisture according to the season, the curer must watch carefully to regulate both temperatures and ventilation to drive off the excess moisture just so fast as it is given off by the leaf. Many growers in the season just past packed their tobacco too closely in their sheds, and difficulty was experienced in getting rid of the moisture fast enough. Once the blade of the leaf has been dried out by raising the temperatures slowly to 120° over eight to twelve hours, there is little to fear.

The third stage is called killing the leaf, during which the temperatures are raised slowly over a period of from eight to ten hours to 125° F. and the life in the leaf is killed.

The fourth stage includes drying out the mid-rib and stalks by raising the heat about 5% per hour to 160°-180° until the whole is completely dry and the cure is effected.

This system is looked upon as the safest employed, but there are many modifications in use, some of which may be tried with good results. One of these is to raise the temperature to 90° F. over six hours after the tobacco has been placed in the barn; then, six hours later, to 100° F.; and to 110° after a further six hours, when the tobacco should have yellowed well. Then the temperature is raised to 120° and again in six hours to 125°, and after a lapse of six hours to 130°, then to 140° in three hours, and kept at this temperature for six hours, when the leaf should be cured. To dry out the stalks, the heat is raised to 150° in three hours and held at this for three hours, and, finally, to 170° in twelve hours, and kept at this temperature until all moisture is driven out.

This system takes seventy-five hours in all, but again much will depend on the changes taking place in the tobacco, and different sheds may require different periods of certain temperatures, especially during the yellowing and drying off periods affecting the blade of the leaf, and in all probability heavy tobacco would require longer periods at the different temperatures.

Another system is to start the fires as soon as the tobacco is in the shed, and to take the temperature up to 100° F., and to hold at that for six hours, then to 105° for six hours, then to 110° for twelve hours, and when the tobacco is yellowed go to 120° F. At this stage the doors and ventilators should be opened and the temperatures reduced to 105°;

then raise to 120° F. again and drop to 105° several times until the surplus moisture is driven off. After this has been done, close the doors and hold at 120° for three hours until the leaves are cured and then raise to 128°; again open the ventilators and reduce to 115°; then close vents and raise heat to 130° in three hours, then to 135° in five hours, then to 145° for three hours and to 150° for two hours, then 155° for three hours, and then 160° for three hours, then gradually to 170° until leaf-stem and stalk are thoroughly cured.

FARM NOTES FOR OCTOBER.

EXPERIMENTAL WORK AT STATE RESEARCH FARM, WERRIBEE.

By G. S. Gordon, Science Field Officer.

Seasonal Conditions.

The weather during October was mostly mild and warm, with rising air and soil temperatures, but the wet conditions experienced in August and September were continued. The rainfall for October amounted to 290 points, and brought the total for the first ten months of the year up to 17.28 inches. This is only slightly more than the average for the period, but over half (9.13 inches) of the amount fell during the last three months. It may therefore be said that the dry winter has been followed by a wet spring.

Oaten hay is almost ready for cutting. Barley is well headed, and early wheats are commencing to colour. The last heavy rain was accompanied by strong wind, and this caused some of the best of the crops to "lodge." Barley and oats suffered to a greater extent than wheat, though all are more or less straightening up again. The tangled crop will make harvesting difficult. The continued rain accumulated in small depressions on clay land, and the crop has been killed on some of the worst of these patches. Little or no rust has been noticed so far, and, on the whole, the growing crops are looking very well indeed.

Permanent Rotation Field.

As mentioned last month, spraying experiments with a solution of nitrate of soda and bluestone were carried out on sections of this field, which were badly infested with the weed known as Hoary Cross or "White Weed." The treatment has proved satisfactory in so far as it has been effective in killing the overground portion of the weed, and preventing the development of seed, but further observations and experiments will be necessary to determine its effect on the strong underground or root system. It is worthy of note that while the spray solution scorched up and killed the foliage of the Hoary Cress, it burnt only the tips of the leaves of the cereals amongst which the weed was growing. The present appearance of the treated sections indicates that wheat received a check in growth from the spray; the oat crop was also checked, but to a less extent, while the barley shows little or no detrimental effect from the treatment.

Green Manurial Rotation Field.

The "feeding off" tests are still in progress in this field, and some particularly fine crops are to be seen on the plots comprising this year's wheat section. The best crops of wheat are those following fallow, peas, and rape in 1919, and the worst those that succeeded barley. The latter plots are commencing to appear as though they are affected with take-all, and have a much poorer growth than those on which Algerian oats was grown last year. These remarks apply to the plots on which the crops mentioned were "ploughed in," as well as to those where similar crops were "fed off" in 1919.

Permanent Manurial Field.

The wheat plots manured with superphosphate are still the most promising in this field, and the growth varies according to the quantity of fertilizer which each received. The crop of oats sown without manure to test the residual effect of fertilizers applied to previous crops have been cut for silage. The produce from each plot was weighed and sampled, but the results will not be available till the samples have been analyzed to determine the amount of dry matter each contained.

Stud Cereal Field.

This field is also looking well, though some of the weak-strawed varieties and selections have "lodged." Some of the cereals, particularly barley, collected in the Jordan Valley and Palestine by Major Cherry, A.A.M.C., and sown in this section show promise of usefulness. Cross fertilization has been attended to during the month, and further crosses will be made as the opportunity occurs.

Lucerne.

The first cutting has been made on the new series of plots sown to this crop, and the second growth for the season is coming away well. The top-dressing tests once again, and this time in an even more pronounced way, point to the advantages of supplying this important crop with suitable and sufficient top-dressings to enable it to make its best growth. Practically all the top-dressed plots are noticeable by the taller and thicker crop of lucerne which they have produced, and some of the best may be arranged in the following order of merit:—

1. Plot receiving farmyard manure, 10 tons, and lime 1 ton per acre.
2. Plot receiving farmyard manure, 10 tons per acre.
3. Plots receiving super. 2 cwt., with (*a*) gypsum, 1 ton; or (*b*) lime, 1 ton per acre.
4. Plots receiving super., 2 cwt. per acre.
5. Plots receiving other phosphatic fertilizers.
6. Plots receiving gypsum or lime.

The top-dressed plots not only have a much better crop of lucerne, but the greater vigour and more rapid growth of the plants has enabled them to resist disease and pests to a much greater extent than the untreated sections adjoining.

Summer Forages.

An area has been sown with summer forages, the chief part of which is Japanese Millet and Sudan Grass. These forages are sown in drills and broadcast as well as under dry and irrigated conditions. Variety tests of different sorghums, millets, &c., have also been sown, and also small plots of maize, soy beans, cow peas, and other introduced beans intended for the production of seed.

Sugar Beet Improvement.

Over 100 selections of sugar beet have been sown. The seed of these being obtained from mother beets of high sugar content, and sown with check or control rows of imported seed spaced at intervals of ten rows.

ORCHARD AND GARDEN NOTES.

The Orchard.

E. E. Pescott, F.L.S., Pomologist.

Spraying.

The spray pump should now be in thorough working order, so that the various spring sprayings may be carried out with as little interruption as possible. It is always wise to clean out the pump after each spraying, so that it will be ready for the next mixture. Putting a different spray in a pump barrel that has not been washed out, very often causes the formation of a sediment, which blocks the nozzle and interrupts the work.

During November it will be necessary to spray for codlin moth, peach aphis, pear slug, and various leaf-eating insects. In addition, black spot of the apple and pear, shot hole, and other fungus diseases must be kept in check. As various sprays are required for all of these troubles, the necessity of always having a clean pump is evident.

At the present time the best spray for peach aphis is strong tobacco solution, and the same spray may also be used for the pear slug. Arsenate of lead is the better spray for this latter insect, but it should not be used when the fruit is approaching the ripening stage; hellebore may also be used for the slug with good effect.

As a preventive against codlin moth, the trees should be kept well sprayed with arsenate of lead. The first spraying should have been given at the time of the falling of the petals; the second spraying, owing to the rapid expansion of the fruit, should be given a fortnight later. After that the grower must use his own judgment as to the necessity for subsequent sprayings. If the moths be at all prevalent, other sprayings will be quickly necessary.

As the woolly aphis is increasing at this time of the year, it will mean a saving of a large number of buds if this insect be sprayed. Nicotine solution, pine spray, or lime sulphur may be used with good effect.

Cultivation.

The work of ploughing and harrowing should be completed immediately. All crops for green manure should be now under cover, and if the orchard soil is at all heavy or stiff, the grower should make up his mind to grow a crop next season, in order that this condition may be reduced.

The orchard should be kept free from weeds, not only for the conservation of moisture, but in order to do away with all hiding places of the Rutherglen fly, cutworm moths, &c.

General Work.

Grafted and newly-planted trees should be frequently examined, and given an occasional watering and overhead spraying, in order to encourage their growth, and to prevent loss of moisture from the foliage. It is also advisable to mulch young trees with light grass, or straw mulching not too rich in animal manure.

The disbudding of unnecessary shoots and the pinching back or stopping of growths, to prevent their becoming unduly long, may now be carried out. This work is particularly important on young trees.

Graft ties should be examined, and the ties cut wherever any growth is being made. Where the grafts are likely to make any long growth, they should be well staked and tied.

Citrus trees may be planted out, and, after planting, they should be watered and mulched.

Vegetable Garden.

Tomato plants should now receive attention every day; laterals will require pinching back; crowded bunches and shoots should be thinned; the plants should be well tied to the stakes, and liberal supplies of water and manure should be given. One or two more plantings of tomato plants may still be made, so that there may be strong, sturdy plants for the production of late fruits. By planting three or four successions of plants, it is possible to have a good supply of fruits from December to June. Pull up and burn all plants showing any signs of disease.

Celery may now be sown for winter crops. French beans should be largely sown. Cucumber, melon, pumpkin, and all seeds of this family may now be sown in the open.

Where these plants are already growing, the longest and strongest runners may be pinched back, to throw the strength into flowering and lateral growths. Watch the plants for mildew, and use sulphur freely wherever present, especially on the young plants.

Peas, lettuce, radish, turnip, cabbage, and sweet corn seeds may be sown this month. Seedlings from former sowings may be planted out, and it would be well to dip the whole plant in water before planting. This greatly assists the young plants while taking hold of the soil in their new location.

Frequent waterings and frequent cultivation will now be necessary; and all weeds must be hoed or hand-weeded out; mulching with stable manure will greatly assist the plants.

A few beds should now be deeply worked, adding a liberal dressing of stable manure. These plots will then be ready for the celery, cabbage, and other seeds planted during this month.

Flower Garden.

Continue to plant out the various bedding and foliage plants, corms of gladioli, and seed of such tender annuals as Phlox Drummondi, balsam, zinnia, nasturtium, celosia, aster, cosmos and portulaca.

While seeds planted out in the open germinate and grow fairly well, it is advisable during the summer months to plant these in sheltered seed beds, or in a canvas or calico frame. The protection need be on the one side only, preferably the west or north-west; the seedlings are then protected during the hottest part of the day. At the same time the shading should not be sufficient to unduly "draw" them.

The seeds should not be deeply sown, and all waterings should be light. A little water, often, should be the rule for seedlings. Annuals require plenty of room when planted out in the garden. Being quick growers, they are generally gross feeders, and they must have space to develop a good root system. Feeding, too, with liquid manure is helpful when they are reaching the flowering stage.

Dahlias may now be planted out, either from tubers or from young rooted cuttings. These will give good early summer blooms. For autumn and show blooms, the planting should be deferred until the middle of December.

Herbaceous and succulent plants should be staked for protection; included in this section are delphinium, gladiolus, perennial phlox, rudbeckia, &c. These plants will all benefit from liberal mulchings and watering with liquid manure when approaching the blooming period. Spring flowering bulbs, corms, and tubers should now be lifted and stored.

The soil surfaces will now benefit from frequent hoeings and stirrings. Constant waterings will be required if the weather be hot or windy, the cultivation should quickly follow the waterings in order that the moisture may be thoroughly conserved. Mulching with stable manure is also beneficial at this season.

TRAINING TOMATO VINES.

The tomato is a warm weather crop, but by care and attention there is hardly a farm that will not mature some fruit. It will take about 100 days to mature fruit from seed. In order to make the season of production extend over as long a period as possible, the plants should be started under glass. To grow large, strong plants, suitable for outdoor planting, the seed should be started 60 to 75 days before planting in the garden.

There are few plants that will withstand as much rough treatment as will the tomato, but to secure early maturing fruits, it will pay to use care in transplanting. Pot-grown plants will mature fruits earlier than will plants that are not planted with a ball of earth. Market gardeners plant them quite extensively in this way, but use the early maturing varieties.

To secure the maximum yield of good tomatoes, one should plan to train them to a trellis or support them in some way to keep the vines and fruit off the ground. One can space the plants much closer in the row than can be done if the vines are allowed to sprawl in the usual way. The fruit will ripen somewhat earlier on the trellis than they will when lying on the ground. On the other hand, if quantity is wanted and quality is not of much importance, one should allow the vines to grow without hindrance.

SUPPLEMENTARY LIST OF ARTIFICIAL FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652).

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid.				Potash.	Price asked for the Manure per ton.	Where Obtainable.
			Water Soluble.	Citrate Soluble	Citrate Insoluble.	Total.			
		%	%	%	%	%	%	£ s. d.	
No. 1 Complete Manure	Wischer & Co. No. 1 Complete Manure	3·00*	11·05	·32	·33	11·70	11·60‡	14 5 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
No. 2 ,, ,,	Wischer & Co. No. 2 Complete Manure	1·50*	14·02	·41	·42	14·85	5·80‡	10 5 0	,, ,, ,, ,,
No. 3 ,, ,,	Wischer & Co. No. 3 Complete Manure	2·00†	6·80	2·20	3·80	12·80	11·60‡	14 7 6	,, ,, ,, ,,
No. 4 ,, ,,	Wischer & Co. No. 4 Complete Manure	1·00†	11·90	1·35	2·15	15·40	5·80‡	10 5 0	,, ,, ,, ,,
No. 1 ,, ,,	Sickle Brand No. 1 Complete Manure	3·00*	11·05	·32	·33	11·70	11·60‡	14 5 0	Cuming, Smith, and Co. Pty. Ltd. 65 William-street, Melbourne
No. 2 ,, ,,	Sickle Brand No. 2 Complete Manure	1·50*	14·02	·41	·42	14·85	5·80‡	10 5 0	,, ,, ,, ,,
No. 3 ,, ,,	Sickle Brand No. 3 Complete Manure	2·00†	6·80	2·20	3·80	12·80	11·60‡	14 7 6	,, ,, ,, ,,
No. 4 ,, ,,	Sickle Brand No. 4 Complete Manure	1·00†	11·90	1·35	2·15	15·40	5·80‡	10 5 0	,, ,, ,, ,,
No. 1 ,, ,,	No. 1 Complete Manure	3·00*	11·05	·32	·33	11·70	11·60‡	14 5 0	Australian Explosives and Chemical Co., 135 William-street, Melbourne
No. 2 ,, ,,	No. 2 Complete Manure	1·50*	14·02	·41	·42	14·85	5·80‡	10 5 0	,, ,, ,, ,,
No. 3 ,, ,,	No. 3 Complete Manure	2·00†	6·80	2·20	3·80	12·80	11·60‡	14 7 6	,, ,, ,, ,,
No. 4 ,, ,,	No. 4 Complete Manure	1·00†	11·90	1·35	2·15	15·40	5·80‡	10 5 0	,, ,, ,, ,,
No. 1 ,, ,,	Mt. Lyell M.L. No. 1 Complete Manure	3·00*	11·05	·32	·33	11·70	11·60‡	14 5 0	Mt. Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
No. 2 ,, ,,	Mt. Lyell M.L. No. 2 Complete Manure	1·50*	14·02	·41	·42	14·85	5·80‡	10 5 0	,, ,, ,, ,,
No. 3 ,, ,,	Mt. Lyell M.L. No. 3 Complete Manure	2·00†	6·80	2·20	3·80	12·80	11·60‡	14 7 6	,, ,, ,, ,,
No. 4 ,, ,,	Mt. Lyell M.L. No. 4 Complete Manure	1·00†	11·90	1·35	2·15	15·40	5·80‡	10 5 0	,, ,, ,, ,,
Animal Fertilizer ..	"Fertbone" ..	4·00†	..	2·00	8·00	10·00	..	11 11 0	H. C. Pannifex, 22 Market-street, Melbourne
Bone Fertilizer ..	"Echuca" Bone Fertilizer	4·25†	..	8·25	8·50	16·75	..	8 10 0	W. G. Boyle, Goulbourne-road, Echuca
Fertilizer	"Lloyd's" Fertilizer ..	3·83†	..	4·01	7·50	11·51	..	8 0 0	Edward Lloyd, Tunstall
Muriate of Potash ..	D & C Muriate of Potash M	..	..	..	..	..	58·00§	30 0 0	Dalgety and Co. Ltd., 461 471 Bourke-street, Melbourne
,, ,, ..	M.L. Muriate of Potash	..	..	..	..	..	58·00§	35 0 0	Mt. Lyell Mining and Railway Co., 381 Little Collins-street, Melbourne

SUPPLEMENTARY LIST OF ARTIFICAL FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652)

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid.				Potash.		Price asked for the Fertilizer per ton.	Where Obtainable.
			Water Soluble	Citrate Soluble.	Citrate Insoluble.	Total.				
		%	%	%	%	%	%		£ s. d.	
Muriate of Potash ..	Federal Manure P.M. ..	..	..	..	..	..	58·00§		35 0 0	Australian Explosives and Chemical Co., 135 Williams-street, Melbourne
.. .. ..	Sickle Muriate of Potash	..	..	..	..	..	58·00§		35 0 0	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
.. .. ..	Wischer & Co. Muriate of Potash	..	..	..	..	..	58·00§		35 0 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
							Mechanical Condition.			
							Coarse Bone.	Fine Bone.		
							%	%		
Bonedust	"Marvel"	3·74†	..	..	..	23·62	64	36	8 10 0	Spriggs and Porter, Benalla
.. .. ..	"Benson's" Bonedust (B)	3·12†	..	..	..	21·18	51	49	8 0 0	George Benson, Mailor's Flat, Woodford

* Nitrogen as Sulphate of Ammonia.

† Nitrogen as Bone Flesh and Blood.

‡ Potash as Sulphate and/or Muriate of Potash.

§ Potash as Muriate of Potash (Potash Chloride).

Melbourne, 29th September, 1920.

P. RANKIN SCOTT,
Chemist for Agriculture.

REMINDERS FOR NOVEMBER.

LIVE STOCK.

HORSES.—All farm horses in constant work at this season should be well fed with last year's chaff or a mixture of old and new, to which a liberal supply of oats has been added. New chaff or hay alone is not recommended, as it has not the sustaining powers of old hay, and is liable to give rise to digestive troubles. Horses require water at frequent intervals; keeping them for a long time without water, and then allowing them to drink to excess is injurious.

An occasional feed of green stuff will be beneficial. In the event of this being unobtainable, give at week-ends a bran mash, to which is added five or six packets of Epsom salts.

Mares which are away from foals for any length of time should have a portion of milk taken from them before foal is allowed to run with them, otherwise serious results may accrue to foal. Good results follow an allowance of chaff and oats to mares and foals running in paddocks, more especially where feed is short.

At this season the Bot Fly is about, and horses should be frequently examined for the eggs of this fly. The neck, forelegs, and jaws are the parts where the eggs are deposited. Either the use of the singeing lamp under affected parts or the application of kerosene will destroy the eggs.

CATTLE.—Provide succulent fodder and plenty of clean water and shade. The silo is the cheapest method of providing succulent fodder, silage costs less than 10s. per ton to grow and save. Mow and make hay of as much grass as possible. This will keep indefinitely so long as it is protected from the weather. Mice will not work in it. Limewash the cowbails, it helps to keep down flies. Provide "lick" in trough, consisting of salt 20 lbs., bone meal 20 lbs., and sulphate of iron ½ lb. Look out for milk fever. Read up method of treatment in *Year-Book of Agriculture*, June, 1905. Have cows' milk weighed, and tested for butter fat. Rear heifer calves from cows giving satisfactory results. Continue giving milk at blood heat to calves. Be careful to keep utensils clean, or diarrhœa will result. Do not give too much milk at a time for the same reason. Give half-a-cup of limewater in the milk to each calf. Let them have a good grass run or lucerne, or ½ lb. crushed oats each per day in trough. Dehorn all dairy calves, except those required for stud or show purposes.

PIGS.—*Sows.*—Supply those farrowing with plenty of short bedding in well-ventilated sties. Those with litters old enough may be turned into grass run. *All* pigs should be given a plentiful supply of clean water. Read Bulletin No. 16. Pig raising and fattening with present price of pollard and bacon should be highly profitable.

SHEEP.—Join none but shapely, good-fleeced rams with all good ewes procurable. Fatten and dispose of all faulty-mouthed, inferior-fleeced sheep, especially coarse-woolled sorts. When selecting merino rams for coarse ewes do not entertain the dense, short-stapled type, nor yet the extremely long-stapled, locky, absolutely plain-bodied type. Best results will be from rams of good breeding, level made and growthy, fair length of staple, medium-grade wool, moderate density, evenly covered on back, fore arm, below, and thighs, with fronts and necks of good appearance. Where ewe lambs are intended to be held for future breeding, see that the cross results in shafty, fine to medium grade fleeces, as well as a shaply frame. Allow rams to remain with the ewes seven weeks, this period admitting of any ewes coming in season the second time. It is rarely necessary to join more than 3 per cent. of 2 tooths, 3 per cent. of 5 and 6 year olds, or 2 per cent. of 2, 3 and 4 year old rams, unless with young ewes. Where conditions justify it, 4 per cent. of vigorous matured rams with aged coarse crossbred ewes will bring a greatly increased number of twin lambs. Clear wool and burrs from about the pizzles of rams, and cut hoofs into shape before mating. Ewes should be of one breed, or as near one cross as possible, to ensure an even and rapid dropping. Merino and fine cross ewes are in season earliest, first cross or half-breds later, and all ewes with a preponderance of British blood later still. It is useless to join rams with ewes until their proper time of coming in season. Ewes carry their lambs four months, four weeks, four days, or roughly, five months.

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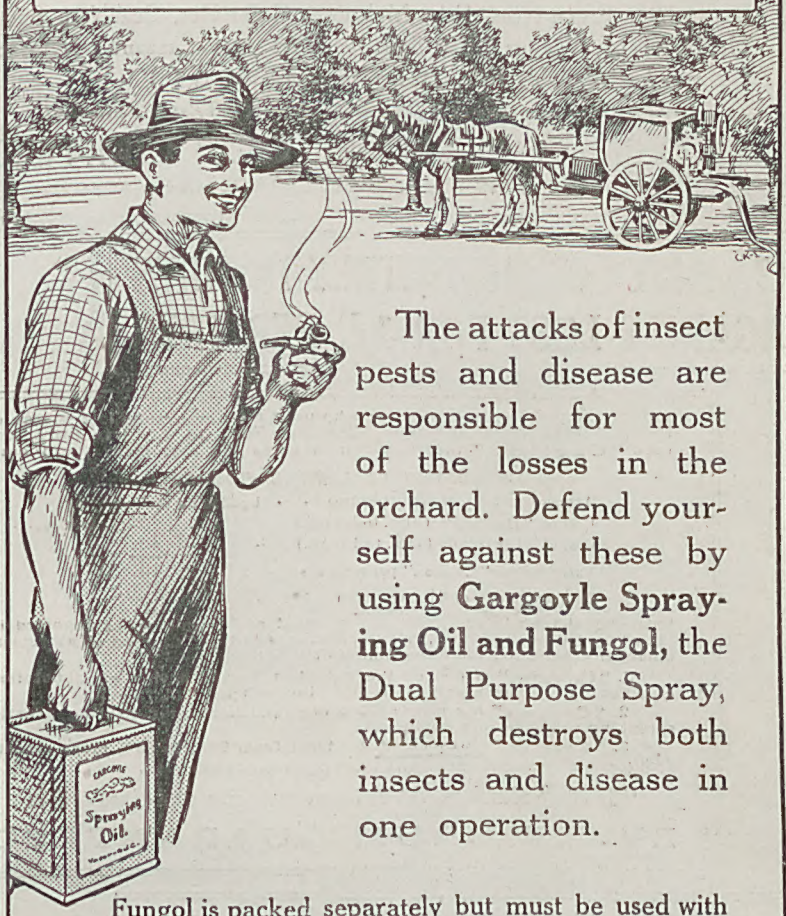

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